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ABSTRACT

This proceedings consists of five research papers presented during the 1997 annual meeting of the American Educational Research Association (AERA). The papers were presented during the sessions of the AERA Vocational Education Special Interest Group. "Predictors of Occupational Choice among Rural Youth: Implications for Career Education and Development Programming" (Carol A. Conroy) confirms existing knowledge in regard to the often unrealistic occupational and educational aspirations held by adolescents: the job opportunities that are likely to be available do not match their expressed interests. "Impact of Environmental Variables on Community College Dental Assisting Students Who Are At-Risk for Persistence" (Debra Daniels) finds a significant difference between graduates and nongraduates on age, enrollment status, hours of employment, college grade point average, and finances. "Student Perceptions about Applied Mathematics" (Malcolm G. Keif, Bob R. Stewart) reports students completing Applied Mathematics 1 or 2 possessed comparable perceptions toward math as a school subject as students completing algebra. "Work-Based Learning: Student Perspectives on Quality and Outcomes" (Cathleen Stasz, Dominic Brewer) reports students in unpaid internships and paid work experience perceive the quality of their work experiences to be similar. "Distance Education Effectiveness as Perceived by Secondary Students" (Michael K. Swan et al.) reports students were satisfied with the quality of interactive video network or interactive television network and believed these courses lived up to their expectations, they did as well in them as in traditional classes, and it was an effective way to teach courses in small rural schools. (YLB)

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# AERA

# Vocational Education

# Special Interest Group

# 1997

# Proceedings

## American Educational Research Association

**1997 Annual Meeting**
**Chicago, Illinois**

**March 24 - 28, 1997**

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# AERA

# Vocational Education

# Special Interest Group

# 1997

# Proceedings

## American Educational Research Association

1997 Annual Meeting
Chicago, Illinois

March 24 - 28, 1997

Diane H. Jackman
SIG Program Chair and Proceedings Editor
North Dakota State University

# NOTES FROM SIG PROGRAM CHAIR

The 1997 American Educational Research Association (AERA) Annual Meeting was held in Chicago, Illinois, March 24 - 28. The theme for the AERA conference was "Talking Together in Educational Research and Practice. The AERA Vocational Education Special Interest Group (SIG) had two paper presentation sessions and a business meeting.

Each paper presented during the Vocational Education SIG sessions was selected through a blind, peer refereed process. Each paper proposal submitted was read by three reviewers.

A copy of the SIG program agenda is provided on the following pages. The papers included in the Proceedings were submitted within the designated time frame.

Diane H. Jackman, Ph.D.
Vocational Education SIG
Program Chair and Proceedings Editor

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# Vocational Education SIG Program

**1997 AERA Annual Meeting**
**Chicago, Illinois**
**March 24 - 18, 1997**

## Monday March 24, 1997

Session Title: Vocational Education SIG Business Meeting
Session Number: 7.02
Location: Sheraton, Colorado, Level 2
Time: 6:15 p.m. - 7:45 p.m.

President: Donna H. Redmann, Louisiana State University
Program Chair: Diane H. Jackman, North Dakota State University
Secretary: N. L. McCaslin, The Ohio State University

## Tuesday March 25, 1997

Session Title: Applied Instructional Techniques
Session Number: 12.09
Location: Sheraton, Parlor A, Level 3
Time: 10:35 a.m. - 12:05 p.m.

Chair: James P. Greenan, Purdue University

Participants:

*Student Perceptions of Applied Mathematics.*
Bob R. Stewart, Malcolm Keif, University of Missouri-Columbia

*The Impact of Technical Education on the Time to Stable Employment Amongst French Youth.*
Yves P. Duhaldeborde, Harvard University

*Distance Education Effectiveness as Perceived by Secondary Students.*
Michael K. Swan, Diane H. Jackman, Steven D. Zimmerman, North Dakota State University

*Impact of Environmental Variables on Persistence of Community College Students Who Are At-Risk.*
Debra S. Daniels, University of Illinois

**Tuesday March 25, 1997**

Session Title: School-to-Work/Work-Based Learning
Session Number: 14.10
Location: Sheraton, Parlor A, Level 3
Time: 12:25 p.m. - 1:55 p.m.

Chair: Hollie Thomas, Florida State University

Participants:

*Work-Based Learning: Student Perspectives on Quality and Outcomes.*
Cathleen Stasz, RAND

*School-to-Work at the Elementary School Level.*
Christine L. Padilla, SRI International

*Predictors of Occupational Choice Among Rural Youth: Implications for Career Education and Development Programming.*
Carol A. Conroy, Cornell University

*Performance Evaluation in School: Can Grades Signal Employability?*
Stephanie D.A. Jones, James E. Rosenbaum,
Northwestern University

# Papers

# Presented

# PREDICTORS OF OCCUPATIONAL CHOICE AMONG RURAL YOUTH: IMPLICATIONS FOR CAREER EDUCATION AND DEVELOPMENT PROGRAMMING

Dr. Carol A. Conroy
Assistant Professor
Department of Education
Cornell University

## Introduction

How a young person views the world of work and how he/she may fit into it affect preparation for entry into the labor market. This view forms from the complex interaction of many factors and can be described as the ideal and expected work role for the individual. Identification of determinants of this occupational identity would provide useful information for the planning and implementation of kindergarten through adult career education and development programs. This study examined occupational identity formation by identifying predictors of participating students' ideal jobs. It was part of a larger study designed to describe the factors which influence entry into and subsequent movement within the labor force (Conroy, 1996).

The rationale for linking labor mobility studies to futuristic education policy and programming is based on several key issues. Few jobs are being created that require low skills levels. In fact, most new jobs (60%) will actually require some level of technical training beyond high school (Gray, 1996; Daggett, 1995), linking the needs of the workforce to the educational system more than ever.

Models of successful training programs assume equal entry position and advancement potential, for both youth and adult participants. Many times the background factors related to gender, race, and other socialization, which should help shape an individualized training program, are ignored in favor of a generic program based on employer needs for specific skills. Counselors and instructors often assume that students, especially those that are disadvantaged, know more than they really do about jobs and careers, information taken for granted in their middle-class frame-of-reference (Heebner, 1995). Low self-confidence and expectations of others often lead to a lack of "cultural capital" (Claus, 1990), ultimately resulting in an inability to identify interests and use skills to find a satisfying job (Heebner, 1995).

Choices made by young people—what courses to take in high school, whether to attend college, what to study—affect who they are and what they do (Adelman, 1994). Making the wrong will reduce possibilities for job success and/or upward mobility over the life course (Topel & Ward, 1992) by limiting the career-line paths which emerge from initial job placement (Spilerman, 1977). This limitation impacts not only the evolution of earnings and status, but also the ability to network, maximize job satisfaction, and exercise voluntary job mobility.

Most career education and development programming focuses on job awareness and exploration activities. Historically, the belief has been that awareness provides information to initiate interest which can then be explored (Herr, 1972; Super & Bohn, 1970). Awareness activities typically occur prior to or during seventh and eighth grades, but exploration usually does not occur until ninth or tenth grades, and is almost exclusively offered to vocational students in the form of career and career-cluster rotations during the first year of vocational school attendance. Unfortunately, this approach is flawed in that it does not address career development needs of college preparatory students and it occurs too late in the educational process for the vocational students for whom it was designed. Many career education programs also ignore the factors which influence interest and choice, factors which exert their influence many years prior to enrollment in those programs.

All of the social, family, and personal experiences of an adolescent interact to form his/her image of a "future self." These images can be both positive and negative; they evolve from integration and evaluation of specific self-attributes and self-assessment of performance in various domains. In other words, adolescents tend to think about the future in terms of aspirations based on what they like to do, emerging from awareness of what they do well (Harter, 1990). Thus, adolescents form their occupational identities through complex interactions of background and environmental factors which merge with the political and social structures of the labor market.

## Theoretical Framework

To be effective, career education programs must be broad-based, centered on experiential learning, and integrated into the total educational program. The individual student must participate in activities to discover his/her talents, relate those talents to the world of work, and refine them for successful use in employment. In fact, educational professionals have long believed that orientation to work and assistance in career choice may be more valid determinants of employment success than specific skills training (USDHEW, 1968).

The purpose of career education and development extends beyond the usual goal of helping individuals choose an occupation or a career. From a broad perspective, career education should result in meaningful and satisfying work for an individual. Career education programs should make realistic choices possible for students by increasing their base of knowledge on which to make decisions.

A critical component of the choice process for young people is how they view themselves—their identity—and the future selves into which they may evolve. Ultimately, the identity, through the decision-making process, works to control the entry portal and subsequent positions of an individual in the labor market. Research on vocational choice reveals that a child rapidly develops ideas about what he/she can do, likes to do, and what others expect him/her to do (Allum, 1993; Kerchoff, 1993; NYSED, 1991; Super & Bohn, 1970). These concepts change over time, evolving into considerations of opportunities, choices, and then reality. Reality considerations become more important to the decision-making process as the young person enters the labor market or some form of postsecondary training and begins initial implementation of his/her identity (Conroy, 1996).

Harter (1990) stated that an adolescent's sense of self and future self is based upon performance in domains where success is important. If this is true, grades earned in school should be predictors of job choice for students who aspire to professional jobs which require postsecondary education. Students who earn higher grades are more likely to be "tracked" into a college preparatory program at an early age; success in school becomes a large part of how they see themselves, and the progression to further education is a natural process.

Parents' education and occupations are indices of adolescent social class (Steinberg, 1989). Most research on social mobility utilizes father's occupation as a measure of socioeconomic status (Blau, 1992; Blau & Duncan, 1967), but evolution of vocational identity also depends upon early experiences with the family (Harter, 1990). Perceptions of career choices also shape individual personality, intimately related to self-concept. The higher socioeconomic family will provide a career frame-of-reference based on values and norms associated with the status of the family (father's occupation). Prior mobility research has shown that a son's occupation is highly correlated with the father's occupation (Blau, 1992; Blau & Duncan, 1967), but few studies have ever focused specifically on female occupational choice and destination as a function of parents' occupations.

Biblartz and Raftery (1993) found that sons in nonintact families identified with the mother's occupation which is likely to be service or clerical in nature. Individuals from nonintact families were less likely to be found in self-employment situations. In particular, the relationship between fathers' occupations and sons' work destinations was found to be reduced by 23% if the family structure was disrupted (Biblartz & Raftery, 1993). Unfortunately, Biblartz and Raftery also did not look at effects of family structure or disruption on the occupational choice and or destinations of females.

Attempts to counteract any negative effects of father's low status occupation or family disruption must, therefore, occur before the influence has permanent effects. In fact, Tideman and Dudley (1967, cited in Herr, 1972) theorized that the school system or guidance methods can order the stages of career development and personal trends can be given new direction or even reversed (Herr, 1972, p. 61). It is unfortunate that, nearly 30 years later, little has been done to further these types of compensatory programs.

Mulkeen (1993) found that participation in activities, in itself, was not related to academic achievement, but the assumed leadership role was related. However, Mulkeen (1993) did determine that leadership activities are positively associated with the number of clubs and other activities in which a student participates. Seeing oneself in multiple roles in addition to the time management, social interaction, and general emotional and intellectual development which results from participation leads to increased self-esteem, and additional "possible selves." Since all input, positive and negative, contributes to identity development, participation in activities most likely provides positive reinforcement and inputs. In addition, this participation begins the formation of networks which are so crucial to social capital and, ultimately, human capital development.

If we lived in a perfect world, we could equalize these factors so that all youth could enter the labor market on an equal footing. In reality, we can only hope to provide each student with the best opportunity to maximize his/her potential by creating a good match between interests, abilities, and career choice through an informed decision-making process.

## Methods and Procedures of the Study

The purpose of this study was to examine the formation of adolescent occupational identity through an identification of predictors of ideal jobs. This was accomplished through the development of a linear regression model to identify predictors of choice of ideal job.

The population for the study consisted of approximately 750 students enrolled in grades 7 through 12 in a rural Pennsylvania school district. Data, collected via survey developed by the researcher provided information about students' attitudes, beliefs, and thoughts about jobs and careers, their self-esteem, and their perceived levels of family communication. The survey instrument consisted of six parts:

1. student identification of ideal jobs and reasons for choice;
2. educational goals and aspirations;
3. demographic information;
4. a self-esteem inventory (Rosenberg, 1985);
5. family communications patterns inventory (Flanagan, 1995); and
6. assessment of workplace skills (V-TECS, 1992).

Prior to its use, the instrument was reviewed by a panel of experts with backgrounds in psychology, sociology, communications, and vocational education to assure content and face validity. In addition, the special education coordinator for the participating school district determined its appropriateness for use with special needs students. Data analyses reported in this paper is from several sections of the instrument.

### Data Analysis

Participants wrote their ideal or "best jobs." A prestige rating for occupations developed by the National Opinion Research Center (NORC) was used to assign a numerical rating to each of the jobs listed by participants (Reiss, 1961). The ideal job prestige score was then used in a multivariate regression analysis as the dependent variable. The jobs were also recoded and collapsed into six categories for descriptive purposes.

Participants responded to 20 Likert-scaled items that represented factors associated with choosing a job. The Likert scale consisted of four choices ranging from "1" (Not Important) to "4" (Very Important). A factor analysis identified underlying constructs in the response patterns; two resulting factors were included in the set of independent variables. They represented how much importance students placed on stabilizing the home and family environment (Cronbach's alpha=.7234) and knowledge of a job and its opportunities (Cronbach's alpha=.7492). The other independent variables were: (1) participation in activities, (2) average grades, (3) gender, (4) family size, (5) parents' occupations, (6) parents' employment status, (7) self-esteem, (8) family structure, (9) parents' education, (10) family communications, and discussions about the future and jobs, and (11) grade level as a proxy for age)[1,2].

---

[1] Dummy variables were created for nominally scaled variables: (1) Dad in House - 1=yes, 2=no; (2) Father's Education Level - Five dummy variables created for the six identified categories; (3) Dad Employed - 1=yes, 0=no; (4) Gender - 1=male, 0=female; (5) Average Grades - 1=above

Appropriate tests determined there were no violations of assumptions of equal variances, normal distribution, independence, and linearity. Collinearity diagnostics revealed that significant linear relationships between the various independent variables were not of sufficient magnitude to distort the regression results.

## Results of the Analysis

Data were collected from a total of 612[3] students which represented the total student population less 80 students enrolled in the "Skills Classes" (formerly classified as trainable mentally retarded), three students who refused to participate, and approximately 50 who were absent on the day of the assessment.

### Characteristics of the Participants

Table 1 reveals that almost two-thirds of the females in the study were or were planning to be enrolled in the college preparatory curriculum as opposed to less than one-half of the males (62.6% vs. 48.5%). In general, more students selected the college preparatory curriculum as their current or planned area of study over a vocational curriculum[4] (56.0% vs. 44.0%) (Table 1).

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average (A's and B's), 0=C's and below; (6) Mother's Education - Five dummy variables created for the six identified categories; (7) Mother Employed - 1=yes, 0=no.

[2] The following variables were intervally scaled: (1) Activity Participation - actual number of self-reported activities in which student regularly participates; (2) Father's Job - numerical prestige score from NORC survey analysis; (3) Family/Home Considerations - Scale created from means of statements included in this factor; (4) Job Knowledge - Scale created from means of statements included in this factor; (5) Encourage Autonomy - Scale created from means of statements included in this factor; (6) Positive Reinforcement - Scale created from means of statements included in this factor; (7) Job Discussions - Scale created from means of statements included in this factor; (8) Family Size - Actual number of persons living in household; (9) Grade Level - self-reported grade in school; (10) Mother's Job - numerical prestige score from NORC survey analysis; (11) Self-Esteem - Scale created from means of statements used to measure self-esteem and based on Rosenberg's (1965) Self-Esteem Inventory.

[3] Some of the analyses have totals that equal less than 612 due to missing data.

[4] Students in the participating school district can elect to attend the area vocational-technical school or can enroll as a vocational student in an approved business education program conducted on-site at the home school.

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Table 1. Program Enrollments by Gender

| | | Program | |
|---|---|---|---|
| Gender | College Prep | Vocational | TOTALS |
| | | (N/Column%/Row%) | |
| Female | 134<br>(58.0)<br>(62.6 | 80<br>(43.7)<br>(37.4) | 214<br>(51.7)<br>(100.0) |
| Male | 97<br>(42.0)<br>(48.5) | 103<br>(56.3)<br>(51.5) | 200<br>(48.3)<br>(100.0) |
| TOTAL | 231<br>(100.0)<br>(56.0) | 183<br>(100.0)<br>(44.0) | 414*<br>(100.0)<br>(100.0) |

*Total of 612 participants less missing values and those 7th-9th graders who are undecided.

Students indicated what they thought they would earn during their first year in their chosen ideal jobs. Males enrolled in the college preparatory curriculum had the highest mean expected salary while females in the vocational program had the lowest (Table 2).

Table 2. Mean Expected Beginning Salaries by Gender and Program of Enrollment

| Program | Male | Female |
|---|---|---|
| College Preparatory | $42,866 | $38,164 |
| Vocational | $32,243 | $26,664 |

A breakdown of the student average grades reveals that females and college preparatory students earn higher grades than males and vocational students. Based on their relative proportions in the general population, female students were over-represented[5] in the three highest grade categories[6]—*A's*, *A's and B's*, and *B's*. Males were under-represented in these categories and over-represented in the lower grade categories. College preparatory students were over-represented in the *A's* and *A's and B's* grades categories. Vocational program students were over-represented in the remaining categories, most notably in the *C's* and *C's and D's* categories.

---

[5] Representation according to proportion of total population is a demographic technique used to examine relationships. In this situation, since females comprise 47.4% of the population, they would represent 47.4% of the distribution of grades in each category if all things were equal.

[6] Grade categories were (1) A's, (2) A's and B's, (3) B's, (4) B's and C's, (5) C's, (6) C's and D's, (7) D's, and (8) D's and below.

A total of 106 students (17.3%) indicated that they did not participate, at least once per month, in any of the given school or community activities. Of the remaining 506 students, most participate in one or two activities per month (Table 3). The mean participation was 1.9 activities with both school and summer sports being the most popular activities for participants followed by church activities. Participation in the school band and community groups were the least frequently reported activities.

The most frequently reported family size was "4" (N=243, 40%). A total of 456 (74.5%) of respondents reported that they live with both their mother and father, while 156 (24.5%) indicated they live with only their mother.

Table 3. Level of Participation in School and Community Activities

| Activity | N | % Total (N=506) |
|---|---|---|
| Band | 97 | 19.2 |
| Choir | 135 | 26.7 |
| Church | 175 | 34.6 |
| Community Groups | 95 | 18.8 |
| School Clubs | 139 | 27.5 |
| School Sports | 289 | 57.1 |
| Summer Sports | 249 | 49.2 |

*Represents the 506 out of 612 total respondents who participate in at least one activity.

An examination of the frequency distribution for parents' educational levels reveals that participants' fathers and mothers are very similar in their highest levels of educational attainment. Fathers were slightly less educated in the sense that a smaller percentage of them had earned high school diplomas than the mothers (46.1% vs. 51.8%) and more fathers than mothers were in the "less than high school education" category (20.6% vs. 13.9%). Few parents, relative to the total of those in the study, were reported to have earned a 4-year college degree. A total of 56 fathers (9.9% of all fathers) and 70 mothers (12.0% of all mothers) earned a BS degree as reported by the participants.

The majority of both participants' mothers and fathers were employed (564 fathers and 489 mothers; 94.8% and 86.7%, respectively. Most fathers work in skilled and semi-skilled trades areas and labor and service jobs (70.4% combined). The highest percentage of mothers work in labor and service jobs (48.4%), with 19.1% holding clerical positions. Nearly 15% of the mothers are employed in professional occupations as compared to 9.4% of the fathers. This is directly due to the fact that 45 of the 53 mothers holding professional jobs are working either as teachers (N=25) or registered nurses (N=20), two typical female occupations.

Over 80% of the male participants (N=198) want to work in either professional jobs or skilled or semi-skilled trade areas. As might be expected, few males desire clerical occupations. Seventy percent (N=170) of the female participants desire professional jobs with a much smaller percentage (9.4%, N=22) aspiring to either clerical or skilled trade jobs. The most revealing information presented by examining the reported ideal job is that 291 of the 473 respondents (61.5%) have ideal jobs which will require at least some level of postsecondary education; many require graduate degrees, special licensing, or certification (Table 4)[7].

## Predictors of Ideal Job Choice

Ordinary Least Squares (OLS) regression identified the subset of variables that, for this population, were statistically significant predictors of ideal job choice. The subset of variables included in the final model were: (1) father's occupation, (2) having knowledge about a job and its opportunities, (3) gender, and (4) average earned grades (Table 5).

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[7] Determined through an in-depth analysis of actual ideal job titles provided by participants.

Table 4. Ideal Jobs as Reported by Participants

| | Job Classification | | | | | | |
|---|---|---|---|---|---|---|---|
| Gender | Profes-sional | Other White Collar | Cleri-cal | Semi/ Skill Trades | Labor/ Service | Farm | TOTAL |
| | N/(Row%) | | | | | | |
| Male | 121<br>(50.4) | 9<br>(3.8) | 4<br>(1.7) | 77<br>(32.1) | 16<br>(6.7) | 13<br>(5.4) | 240<br>(50.7) |
| Female | 170<br>(70.0) | 7<br>(3.0) | 22<br>(9.4) | 22<br>(9.4) | 11<br>(4.7) | 1<br>(0.4) | 233<br>(49.3) |
| TOTALS | 291<br>(61.5) | 16<br>(3.4) | 26<br>(5.5) | 99<br>(20.9) | 27<br>(5.7) | 14<br>(3.0) | 473*<br>(100.0) |

*Missing observations=139. No significant difference exists between respondents and those with missing data.

Table 5. Final Regression Results of Predictors of Choice of Ideal Job

| Source | DF | Sum of Squares | Mean Sum of Squares | F | p | $R^2$ |
|---|---|---|---|---|---|---|
| Regression | 27* | 18177.0 | 699.1 | 6.3 | .0000 | .1867 |
| Residual | 585 | 63967.9 | 109.3 | | | |

| Variable | B | Beta | T | p |
|---|---|---|---|---|
| Father's Job | .1265 | .1181 | 3.52 | .0033 |
| Job Knowledge | 2.7950 | .1423 | 3.76 | .0002 |
| Gender | -6.4418 | -.2721 | 6.99 | .0000 |
| Aver. Grades | 6.5146 | .1972 | 5.04 | .0000 |
| Constant | | 66.3032 | 9.591 | .0000 |

*Mean substituted for missing values

Table 5 reveals that 18.7% ($R^2$=.1867)[8] of the variance in the ideal job scores is due to the combined linear effects of the independent variables in the model. An examination of the Beta weights reveals that gender is the most influential predictor in the model (-.2721) followed by average grades (.1972), knowledge about a job and its opportunities (.1423), and father's occupation (.1181).

A large portion of the variance in ideal job scores is unexplained by this model (81.3%). The instrument used in this study was able to capture many of the background factors which combine to form the adolescent's sense of who are what he/she may become in the world of work. However, other factors were not measured—race, intelligence, any recent or other important family migration, and any cohort effects. Race, in particular, is a strong factor in identity development (Hacker, 1992; Harter, 1990), but, as noted was not a factor due to the homogeneous nature of the community. In addition to these important variables, there was no way to measure the political and social structure of the labor market in this study, factors known to influence the entrance and movement of individuals and groups into the labor market (Tumin, 1953; David & Moore, 1945). The model, however, provides insight into the intersection of socioeconomic status and gender as they relate to adolescent development of a work identity

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[8] This value is the adjusted R-square value since it takes into consideration the number of variables in the model. Partial residual plots were created for all independent variables in the equation as a means to test for normality of distribution. All plots revealed that no normality assumptions were violated.

## Conclusions and Recommendations

This study confirms existing knowledge in regards to the often unrealistic occupational and educational aspirations held by American adolescents. The job opportunities which are likely to be available to them, and an occupational structure in which more jobs require less than a BS degree, do not match their expressed interests. It must be noted that several limitations affect the interpretation of the data from this study. First, the use of census data instead of a random sample and a relatively small population reduce the generalizability of the findings. Secondly, the participating school district is located in a very homogeneous community which eliminated the selection of race, a known important factor in identity formation and job mobility potential, as an independent variable. In addition, there are some known limitations with the use of self-reported data. Even with these limitations, however, sound conclusions and recommendations can be made based on the data analysis:

More students in the study are presently enrolled in the college preparatory curriculum of the local high school than are likely to go to college. As a consequence, the students who participated in this study are not likely, overall, to meet their educational and, as a consequence, their occupational goals. Based on prior discussions which focused on parents' occupations, students, if they remain in the area, are likely to be underemployed. This is not only due to the reality of the job market, but also their ideal job choices.

The participating students have inadequate information about the salary structure of the labor market. Even though the majority of them have chosen professional jobs as their ideal, the expected salaries are much higher than what is the norm for Pennsylvania communities.

Female students in the area are not socialized to limitations of their occupational goals based on considerations of marriage and children. There is less identification with traditional female occupations for the females participating in this study as compared to the norm 25-30 years ago (Super & Bohn, 1970).

Children from advantaged backgrounds, as evidenced by fathers' occupations of higher status are more likely to aspire to higher status jobs than children from disadvantaged homes. Students also evaluate, differentially, influences on ideal jobs based on their source of gratification, specifically, knowing about a job and its potential for opportunities. Individuals with an orientation towards a job and its rewards are more likely to select higher status ideal jobs than persons who do not value those things as much.

Academically talented students are more likely to select higher status ideal jobs than students who earn lower average grades. Much of this is out of the control of the individual since IQ is not something developed consciously. However, IQ is not necessarily a precursor to achievement which is influenced by many environmental factors.

Having choices in decision-making and the ability to arrive at answers to problems are keys to maximizing individual and collective human potential. Decision-making and problem solving should ideally be processes which include an evaluation of facts rather than tradition, bias, and prejudice. For young people, the decision-making process is crucial as they make educational and other choices, particularly those involved with choosing an occupation and/or a career. Appropriate decisions made prior to entry into the labor market help ensure that adolescents' and teens' chosen work roles will more closely match careful assessments of interests, abilities, and labor market needs. Each student must be provided with opportunities for self-discovery of his/her talents, and with appropriate instruction and activities to relate those talents to the world of work.

Based on the data analysis, consideration should be given to the following recommendations:

Job awareness and exploration are important beginnings of the workforce preparation process; it is, therefore, recommended that they occur at an earlier age and simultaneously over a longer period of time. Adolescents tend to make early commitments to choices (Harter, 1990)—choices which involve education and other forms of "tracking," and impact on the future in ways unimagined. Poor decisions at an early age result in "settling for" less than would be otherwise, a functional adaptation to the set of limiting conditions created as a result of the decision-making process.

Data on labor market trends, as published by the national and state departments of labor and industry, should be provided to all students. The data should be provided as part of regular, planned courses of study, and not just as available resource material, with activities focused on reading and evaluation of county and local labor market data. Development of skills related to setting short-term, incremental, and achievable goals, based on implications derived from the labor market data, should be a primary objective of this coursework. Ideally, these activities should be integrated into existing program offerings.

Students should be required to investigate job opportunities and descriptions in all the major categories of the jobs hierarchy which would include an analysis of the following job characteristics or requirements: 1) initial education and training, 2) typical time and other related commitments such as continuing education, travel, overtime, and weekend work, 3) physical demands to include manual labor and emotional/mental stress, 4) technical and manipulative skills aptitudes, 5) levels of social interaction, 6) existing salary structure, 7) opportunities for advancement, and 8) performance evaluation measures. It is also critical to determine locations of availability for the jobs investigated—few students in the study could identify a firm, agency, or other location at which they might pursue their ideal jobs.

Individualized measures of interest and aptitude should be part of an ongoing process as students engage in experiential activities exploring various job and career opportunities. Students should be taught how to critically evaluate themselves in terms of how they may "match" specific occupations currently under exploration. A "Career Development Portfolio" would be a most appropriate vehicle for maintaining this information, to be revised on a regular basis.

Career education programs that do not contain compensatory education components may not achieve their goals. It is recommended that steps be taken to identify individual barriers to accessing and processing of information in an effort to compensate for selectivity of information delivery such as that which results from socioeconomic condition. Some compensatory education components may be provided through interagency collaboration, and should focus enhancing the social interaction skills of participants as well as provide knowledge—the use of simulated work teams can be one way to integrate workplace skills with social skills.

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# IMPACT OF ENVIRONMENTAL VARIABLES ON COMMUNITY COLLEGE DENTAL ASSISTING STUDENTS WHO ARE AT-RISK FOR PERSISTENCE

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## Introduction

Across the United States, community colleges enroll 55% of the first-time college students. Of these students, at least one-third are considered at-risk for persistence (Roueche & Roueche, 1993). Of the students who are at-risk, approximately 57% are women (National Center for Education Statistics, 1991). Nontraditional students are identified as having at least one of the following three characteristics: they attend school part-time, commute to school, and are older than 22 years of age (Bean & Metzner, 1985). Because of these defining characteristics, nontraditional students are considered "at-risk" for college persistence (Roueche & Roueche, 1993). Therefore, the term at-risk and nontraditional are interchangeable.

Because community colleges attract a high percent of students who are at-risk, community college programs that attract a higher female population are likely to have a high percent of female students who are at-risk for persistence. Health occupation programs (i.e., Dental Assisting, Dental Hygiene, Nursing, Physical Therapy Assistant, etc.) because they are traditional female occupations, attract a high percent of female students. In the Illinois Dental Assisting Programs, the attrition rate during the 1995-96 academic year was 55% (Holbrook, Westerhoff, & Pearson, 1995). Of the enrolled students in these Dental Assisting Programs, nearly 100% were at-risk of persistence and also female. This high attrition rate demonstrates the need for research in the area of persistence of community college students, particularly those in health occupation programs such as Dental Assisting.

The purpose of this study was to determine if the environmental variables of faculty contact, peer interaction, and family encouragement impacted the persistence to graduation of community college dental assisting students in Illinois. If environmental variables do impact persistence, college personnel can be better prepared through specialized programs and/or services to intervene and possibly increase students' chances of program completion.

## Background

In 1902, with the establishment in Illinois of Joliet Junior College, the first junior college in the United States and the predecessor of the comprehensive community college of today, the educational mission of the two-year junior college seemed clear. It was to prepare students for the university by providing the first two years of their advanced education, and to discourage those students who could not handle the challenges of higher education from continuing at the university level (Henderson, 1960). Junior colleges were located in the geographic vicinity of the students, so they did not have to travel a great distance, and were more affordable than attending a university. Community colleges did not have the stringent admission standards of universities, which helped establish the "open door" admission philosophy (Cohen & Brawer, 1991).

Enrollment at junior colleges began to swell with the passage of the 1944 GI Bill of Rights, which established education benefits for veterans of military service. A short time later, the 1947 Truman Commission on Higher Education declared that all citizens, regardless of background, should be provided with an education through the 14th grade. This recommendation cemented the community college's role as a major force in American higher education (Eaton, 1994). Subsequently, the role of the junior college began to change from that of a transfer institution to an institution encompassing a wider variety of educational opportunities that more closely reflected the needs and abilities of the students in attendance (Cohen & Brawer, 1991; Roueche & Roueche, 1993).

At the same time, the makeup of the student population attending community colleges also changed. In the beginning, when the community college was considered a transfer institution, the traditional student had clear-cut education goals and was academically prepared to achieve them (Cross, 1968). However, as the community college was called upon to educate a wider range of students for a broader spectrum of career choices, the nontraditional student population exploded on community college campuses. The nontraditional attenders had not been successful in high school academic studies, and their parents were not likely to have attended college. According to Karabel (1972), these nontraditional students came mostly from Caucasian blue-collar families and minority families from all socioeconomic levels.

By the mid-1970's the enrollment pattern of the community college had shifted, and a new stratum of student emerged. These students were not necessarily first generation college attenders, were not necessarily considered disadvantaged socioeconomically, but did exhibit learning problems and had a history of academic underachievement. Thus, the enrollment patterns were exhibiting the first significant numbers of students who were attracted to the community college because of its open door admission policy; but, who were also at-risk of nonpersistence (Cross, 1976).

By 1990, the average age of the community college student was 28 (Cage, 1992). The student was likely to have family obligations, work 20-30 hours per week and attend college on a part-time basis (Pascarella & Terenzini, 1991). Students who are at-risk now, as then, have low self-esteem and are less likely to identify with academic attainment, and therefore may not establish or aspire to realistic goals, setting themselves up for continued academic failure leading to nonpersistence (Roueche & Roueche, 1993).

## Postsecondary Persistence Research

In an effort to bring order and gain understanding from the research on the persistence process, Tinto (1975) developed a predictive persistence theory which embodies the concepts of academic and social integration of the student in the institution. The longitudinal model posits that the higher the quality of the student's social and academic integration in the institution, the more likely he/she will persist at a particular institution. Background variables (e.g., gender, age, race/ethnic origin, educational goals, enrollment status, high school performance, hours of employment, finances, and family responsibilities), according to Tinto, influence a student's commitment to his or her educational goal, which could affect a student's persistence in college.

Several researchers studying postsecondary persistence have used Tinto's (1975) persistence model, and their findings generally support Tinto's construct of academic and social integration. In an attempt to validate Tinto's (1975) persistence theory, Bean (1980) and Pascarella and Terenzini (1980) each applied Tinto's (1975) model to a full-time freshmen class from one residential university. Bean studied 1,111 randomly sampled freshmen students from a major midwestern university. Data were collected via a 104 item mailed questionnaire which resulted in a 66% return rate. The sample was limited to Caucasian, single, nontransferred students under the age of 22 years. The data were analyzed using multiple regression and path analyses. The findings revealed that students who indicated a high frequency of faculty contact and peer interaction, two signs of social integration into the institution (Tinto, 1975), were significantly more likely to persist in college than those students who indicated a low frequency of interactions with faculty and peers. Thus, the findings support Tinto's construct.

Pascarella and Terenzini (1980) studied 773 freshmen students randomly sampled from Syracuse University, a large university with a total undergraduate population of approximately 10,000 students. A questionnaire was developed using the variables outlined in Tinto's model, which are academic development, peer interaction, faculty interaction, and background characteristics. The survey was mailed to the students in the sample and a 77% return rate was achieved. Multivariate and discriminant analyses were used to analyze the data. The findings generally support the aspects of Tinto's model. Of particular interest, the results indicated that student/faculty relationships contributed strongly to the persistence of this group, as measured by frequency of faculty contacts.

A limitation of these studies is that they were each performed on a sample from a single institution. Thus, the findings may lack generalizability across different institutions. Also, nearly all tests of Tinto's model have used four-year, large, residential institutions, so the model cannot be generalized to the community college population which is usually commuter in nature, older, and more diverse.

Attempting to overcome the single institution sampling problem, Munro (1981) tested the validity of Tinto's (1975) model by using the National Longitudinal Study (NLS) of the High School Class of 1972. The NLS population was comprised of full-time students entering four-year institutions in the fall of 1972. This study sampled 6,018 students from the NLS 1972 data set. Questions and responses were taken from the questionnaires that addressed the variables necessary to Tinto's model, which are academic development, peer interaction, faculty interaction, and background characteristics. Path analysis was used to interpret the data collected concerning these variables, resulting in findings that generally support Tinto's model. However, the data were not disagregated by institutional type, so generalizability to specific institutions such as community colleges is not possible.

Pascarella and Chapman (1983) attempted to solve some of the earlier problems of validating Tinto's persistence model in a study of 2,410 full-time freshmen students from 11 institutions. The students were asked to complete the Student Involvement Questionnaire (SIQ). The questionnaire asked students to respond to questions concerning student involvement in institution activities and personal commitment to complete college, which Tinto (1975, 1987) has projected as aspects of social and academic integration. The freshmen were additionally asked about background and personal characteristics. The 11 postsecondary institutions used in this study were categorized as follows: 4 four-year residential institutions, three commuter community colleges, 2 commuter four-year institutions, and two private, liberal arts colleges with mixed commuter and residential students. The results generally support the constructs of Tinto's (1975) model and replicate the findings of the single institution studies performed by Pascarella and Terenzini (1980) and Bean (1980). The study's findings revealed that two-year commuter student persisters had less contact with both peers and faculty than those students who voluntarily withdrew. On the surface, this seems to be contrary to the expectations outlined in Tinto's theoretical model. However, the study did not differentiate between students who merely transferred to a four-year institution and those who dropped out of higher education completely.

In order to take into account the unique persistence pattern of nontraditional community college students, Bean and Metzner (1985) developed a Nontraditional Undergraduate Student Attrition Model. This model suggests that the nontraditional student uses four sets of variables in a withdrawal decision. First, poor academic performance tends to lead students to drop out at a higher rate. Second, withdrawal decisions are based on intent to leave the institution, which is affected by academic and educational goal commitment. Third, background variables influence persistence. Fourth, the withdrawal decision is directly affected by environmental variables. The researchers state that environmental factors are more important to persistence than academic variables and can possibly overcome negative effects of the academic variables. Students with a positive psychological outlook that view the education that they are receiving as useful, necessary and relevant may overcome previous low academic performance (Bean & Metzner, 1985).

Background variables such as age are very significant in the Bean and Metzner (1985) model because nontraditional students tend to be older, and older students tend to withdraw at a higher rate (Astin, 1975). The model takes into account that older students are more likely to have family responsibilities and jobs, which, in turn, affect academic achievement, which leads to persistence or nonpersistence in college.

Bean and Metzner (1985) consider residence of nontraditional students as a crucial variable in their nontraditional student persistence model. Nontraditional students are generally commuter students and therefore spend little time on campus outside of class. They also have fewer college friends, fewer contacts with faculty, and are involved in fewer extramural activities as compared to residential college students. Consequently, social integration is assigned a low priority in the Bean and Metzner (1985) model as compared to the high emphasis placed on social integration in the Tinto (1975) model. Although it may be true that the commuter student does not have the same opportunity to socialize as residential students do, it does not mean that the nonresidential students would not benefit from increased opportunities to interact with peers and faculty.

In order to validate the Bean and Metzner model, Stahl and Pavel (1992) studied 665 students from a commuter 2-year institution. The sample was taken from students enrolled in a beginning course of reading, English, and mathematics offered at the institution. Sections of these classes were randomly chosen and students present in class on the day the survey was administered constituted the sample. The sample size was 1,519 students of which 665 students returned the survey for a return rate of 44%. Exploratory factor analysis and structural equation modeling were used to discover how well the survey data fit the model. The findings indicate that the following variables were significant indicators of persistence, which is consistent with the model: enrollment status, educational goals, high school performance, finances, hours of employment, and family responsibilities. They also found that outside encouragement from family, interaction with peers, and contact with faculty members, variables not emphasized in the Bean and Metzner model, to be significant.

The persistence variables, which include the environmental variables of faculty contact, peer interaction, and family encouragement, are thought by researchers to affect student persistence to college graduation. Tinto (1975) recognized that environmental variables may impact students' decision to not persist in college. He hypothesized that these variables would impact the extent of social and academic integration into the institution.

In order to test the assumption that frequent interaction between student and faculty leads to a higher student retention rate in college, Pascarella and Terenzini (1977) longitudinally studied incoming freshmen from Syracuse University in New York. A random sample of 1,008 students was drawn from the freshmen population of 2,400. Data collection was done at three times in a one-year timeframe. The first collection time point was prior to enrollment in the first semester, yielding a 76% response rate. The second was midway through the second semester yielding a 70% response rate. The last data collection was conducted during fall registration. In the second data collection, Pascarella and Terenzini (1977) asked students to respond to questions concerning the number of times students had contact with a faculty member during each semester for each of the following six reasons: "`to get basic information and advice about my academic program,' `to discuss matters related to my future career,' `to help resolve a disturbing personal problem,' `to discuss intellectual or course-related matters,' `to discuss a campus issue or problem,' and `to socialize informally'" (p. 543). The student was to indicate contacts of 10-15 minutes in duration only. Using both multivariate analysis of variance and discriminant analysis, student/faculty discussions focusing on intellectual or course related matters, career concerns, and academic advising were found to have a higher frequency of occurrence in college persisters than in voluntary leavers.

Pascarella, Duby, and Iverson (1983) applied the same research design as Pascarella and Terenzini (1977) to a commuter university. The sample was randomly drawn from the population of 1979 entering fall semester freshmen at a large, urban, commuter university. The sample numbered 269. Students were asked the same questions concerning faculty contact. However, this time the results indicated a statistically significant negative relationship between faculty contact and college persistence. This seems contrary to the hypothesized model of college persistence and research performed at residential institutions (Pascarella & Terenzini, 1977). However, it seems that the researchers did not differentiate between voluntary nonpersisters and those who transferred to a four-year institution. Because the transfer students were mislabeled as nonpersisters, it is possible that the findings may not be accurate.

Tinto's (1975) model hypothesizes that peer interaction, which results in social integration into the institution, should positively impact the persistence of students in college. In an attempt to validate Tinto's hypothesis, Pascarella and Chapman (1983) studied a random sample of 2,326 freshmen from 11 postsecondary institutions. The longitudinally designed study collected data three times between the fall semester of 1978 and the fall semester of 1980. The response rate was 35%. The study asked the students to respond to questions pertaining to peer interaction. The questions asked the students to indicate how many times in the last academic year they had interacted with peers in a nonclassroom setting for 10 minutes or more to discuss topics of a campus or social issue, to discuss a personal problem, or to socialize informally. The findings for residential institutions demonstrated a positive association between high peer interaction and persistence in college. At commuter two-year institutions, college persisters had significantly less contact with peers than voluntary nonpersisters. Once again, this may reflect the fact that the voluntary nonpersisters transferred to four-year institutions and not that they dropped out altogether. Also, the sample was under-representative of older nontraditional students, and therefore, the findings may not be representative of the students at commuter two-year colleges.

A large portion of a study by Williams (1994) investigated peer interactions. In a qualitative study of nontraditional female students attending an Australian community college, Williams interviewed six students enrolled in a one-year certificate-granting business course. The students were followed for six months. The process used to gather data involved participative observation, interviewing, and interpretive interactionism. Interpretive interactionism is characterized by reporting the experiences of the participants with thick description and interpreting their experiences in the context of the environment in which they were experienced (Williams, 1994). Each student was interviewed for a minimum of 4 1/2 hours in the six-month period. Each of the six students indicated that interaction with their college peer group increased their likelihood to persist to graduation. This was accomplished through words and actions of encouragement to each other to succeed, by helping each other tangibly by sharing books and other resources, and by assisting each other to overcome problems initiated by stress, monetary need, time constraints, and competing priorities. This study concluded that peer interaction is important to the college persistence of commuter two-year college students.

Encouragement from family members exerts an important influence on the persistence of students who are at-risk and the completion of a college program. In the study of female Australian community college students discussed above (Williams, 1994), some participants reported that interaction with family members could be detrimental, while others felt it to be crucial to academic survival. One participant reported that her ex-husband was very critical of her school endeavors, which served to lower her self-esteem. Another indicated that although her parents were very proud of her, they could not understand what she was going through because she was a first generation college attender. However, the study cited more positive than negative interactions with family members. One of the study's participants responded as follows when asked about family interaction:

> Well, the kind of encouragement that I get from my family is very positive. They ask me, "How am I doing?" and they are very positive about what I am doing; they think that the course is good for me. If I tell them that I have passed another subject they say, "Well that is great!" and it is just such very positive reinforcement. I mean I know what I am doing is right but it is nice to hear it from others. (Williams, 1994, p. 160)

Although there is little research found in the area of family member interaction, the available data support the contention that family member interaction can influence the persistence to educational goal completion of community college students.

## Persistence Model

Through their research, Pascarella (1985) and Bean and Metzner (1985) have indicated that the environmental variables of peer interaction, faculty contact, and family encouragement may contribute to a student's persistence to graduation. Therefore, the persistence model in Figure 1 depicts these three tenets as independent variables. The following background and academic variables have been used in other persistence studies (Bean & Metzner, 1985; Pascarella, 1985; Pascarella & Chapman, 1983): gender, age, race/ethnic origin, educational goals, residence, enrollment status, high school academic performance, hours of employment, finances, parents' education, family responsibilities and college performance. The variable of remedial education is the exception. It has not been tested in other studies. However, the researcher considered it an important variable in light of the number of community college students who need and who take remedial courses. Therefore, the effect of remedial courses on persistence should be considered. The dependent variable was persistence to graduation. Most studies determine persistence by a student returning to school the next term or school year. However, because the population sampled in this study was from one-year certificate programs, graduation from the program was the best indication of persistence (see Figure 1).

## The Problem

To address the question, what impact do environmental factors have on community college dental assisting students who are at-risk of persistence, the literature provides several perspectives. In fact, the greatest strengths of the literature available in this area are the well developed and tested models of student retention. Nonetheless, the greatest limitation is that all the studies were performed on the general population of the colleges and universities. Additionally, no previous research has focused on the unique persistence patterns of community college students considered at-risk because they are older, commute to school, and are likely to attend college part-time. Therefore, in light of the lack of research on students who are at-risk, this research study was conceived.

## Design

The simple random sample used in this study was drawn from the population of students enrolled in seven of the eight Illinois Dental Assisting Programs during the academic years of 1993-94, 1994-95, and 1995-96. The population total was 450 and the simple random sample was 206.

The survey instrument was constructed by the researcher and was influenced by an instrument designed by Pascarella and Terenzini (1980) which was based on research of Wilson, Wood, and Gaff (1974). The instrument was reviewed for content validity by an expert panel as well as by members of the researcher's doctoral committee. With minor changes based on input from the expert panel and doctoral committee, the survey instrument was mailed to the students in the pilot study and tested for reliability. After review of the pilot study, the survey instrument was mailed to students in the random sample.

The total number of surveys returned was 124 out of 206. Two survey responses were received after the beginning of data entry and were not used. The 122 useable responses represented a 59% return rate. Of the 206 surveys mailed, 27 or 13% were returned undeliverable. The collected data were tabulated and analyzed using the Statistical Package for Social Sciences (SPSS) software. Descriptive and inferential statistics were used to analyze the data.

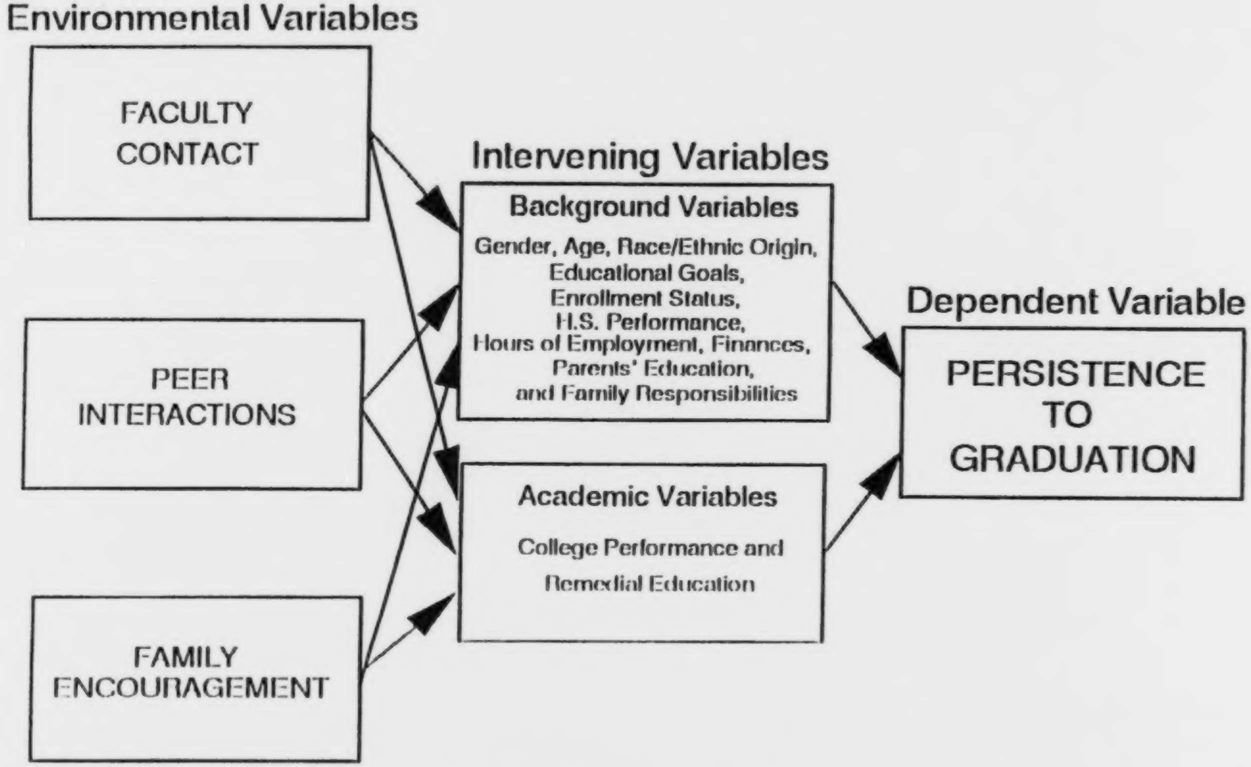
Environmental Variables
FACULTY CONTACT
PEER INTERACTIONS
FAMILY ENCOURAGEMENT
Intervening Variables
Background Variables
Gender, Age, Race/Ethnic Origin, Educational Goals, Enrollment Status, H.S. Performance, Hours of Employment, Finances, Parents' Education, and Family Responsibilities
Academic Variables
College Performance and Remedial Education
Dependent Variable
PERSISTENCE TO GRADUATION

Figure 1. Proposed model for community college students who are at-risk for persistence.

## Discussion of Findings

As stated earlier, the purpose of this study was to examine the three environmental variables of faculty contact, peer interaction, and family encouragement with respect to community college students enrolled in Dental Assisting Programs in Illinois, and to determine if these variables predict persistence to graduation. A discussion of the significant findings related to this purpose follows.

The characteristics of the dental assisting graduates and nongraduates were compared. The sample was predominantly female (97%) and Caucasian (86%). The analysis determined that there was no significant difference between graduates and nongraduates on gender and race/ethnic origin. The mean age of 29 for nongraduates and 25 for graduates represented a significant difference between the two groups.

The background variable of goal commitment was determined to be a lifetime educational goal of bachelor's degree for nongraduates (38%) and associate's degree for graduates (47%). Although there was a great deal of variability in responses for both groups, a significant difference was not found between nongraduates and graduates. However, a significant difference was found between graduates and nongraduates on importance of completing the Dental Assisting Program. Nongraduates indicated the selection of Very Important at 50% and graduates indicated Very Important at 94%.

Nongraduates (48%) were more likely to attend college part-time compared to graduates (22%). A significant difference was found between nongraduates and graduates and their enrollment status. Nongraduates also reported a lower average high school GPA (mean=3.05) compared to graduates (mean=3.22). However, the difference was not statistically significant. Nongraduates were employed a mean of 26-30 hours per week compared to graduates at 21-25 hours per week. A statistical significance was found for hours of employment and persistence. Receipt of financial aid had a statistically significant relationship with persistence, 23% of the nongraduates reported receiving financial aid compared to 41% of the graduates. Parents' education was not related to persistence. Nongraduates indicated 41% of mothers and 33% of fathers reported some college or higher compared to 39% of mothers and 42% of fathers for graduates.

Family responsibilities were determined by marital status, dependent children living with them, and adequate daycare. Of the nongraduates, 50% were married or had a live-in significant other, 50% had dependent children living with them, and only one person indicated a daycare problem. Of the graduates, 40% were married, 32% had dependent children living with them, and only one person indicated a daycare problem. A significant difference was not found between the two groups on these variables.

The academic variable of remedial education was determined by taking and completing remedial English, remedial math, remedial reading and study skills courses. Of the nongraduates, 33% completed remedial English compared to 58% of graduates, 18% completed remedial math compared to 43% of graduates, 11% completed remedial reading compared to 24% of graduates, and 11% completed study skills compared to 22% of graduates. A significant difference was found between nongraduates and graduates for completing remedial English and remedial math but not for remedial reading and study skills.

The academic variable of college GPA demonstrated a mean of 3.03 for nongraduates and 3.32 for graduates. A significant difference was found between college GPA and persistence, showing graduates had a higher GPA.

The graduate and nongraduate responses to the survey items, which represented the independent variables of faculty contact, peer interaction and family encouragement, were compared. In comparing the faculty contact data, dental assisting graduates compared to nongraduates were more likely to:

1. Talk to a Dental Assisting instructor about their academic progress. Graduates indicated Almost Always or Always 69% of the time compared to 46% for nongraduates.
2. Talk to a Dental Assisting instructor about a topic from class they did not understand. Graduates indicated Almost Always or Always at 68% compared to 50% for nongraduates.
3. Socialize with a Dental Assisting instructor outside of school. Graduates indicated Sometimes at 39% and 14% for nongraduates.
4. Talk informally with a Dental Assisting instructor about nonschool/nonproblem topics. Graduates indicated Sometimes at 50% and 41% for nongraduates.

Pearson product-moment correlation analysis and independent sample *t*-test analysis indicated that these four items had a significant relationship to persistence and displayed a significant difference between graduates and nongraduates at the $p<.05$ level. Variables that were not significantly correlated with persistence were talking to a Dental Assisting instructor about basic program information, career choices and goals, personal problems, or campus-wide issues.

In comparing the peer interaction data, graduate respondents compared to nongraduate respondents were more likely to:

1. Study with one or more of their peers. Graduates indicated Almost Always or Always as the frequency of peer studying by 56% compared to 29% for nongraduates.
2. Discuss school problems. Graduates indicated Almost Always or Always as the frequency of discussion of school problems with peers at 77% compared to 52% for nongraduates.
3. Discuss personal problems. Graduates indicated Almost Always or Always as the frequency of discussion of personal problems with peers at 49% compared to 16% for nongraduates.
4. Socialize with peers outside of school. Graduates indicated Almost Always or Always as the frequency of socialization with peers outside of school at 43% compared to 11% for graduates.

Pearson product-moment correlation analysis and independent sample *t*-test analysis indicated that all four of the peer interaction items had a significant relationship to persistence and displayed a significant difference between graduates and nongraduates at the $p<.05$ level.

In comparing the family encouragement data, graduates compared to nongraduates were more likely to:

1. Receive positive comments from family members concerning the completion of the program. Nongraduates indicated that they Never or Sometimes receive positive comments at 23% compared to 14% of the graduates.
2. Receive positive comments from family members concerning continuing in the Dental Assisting Program. Nongraduates indicated that they Never or Sometimes receive positive comments at 32% compared to 16% of the graduates.

In comparing the family encouragement data, two items received similar responses for nongraduates and graduates:

3. Receive negative comments from family members concerning not attending college. Both nongraduates and graduates indicated they received few negative comments from family members concerning not attending college, 84% and 86% respectively.

4. Receive negative comments from family members that would make them want to quit the Dental Assisting Program. Nongraduates and graduates indicated that they received few negative comments from family members concerning quitting the Dental Assisting Program, 91% and 93% respectively.

The environmental variable of family encouragement demonstrated mixed results when analyzed by the Pearson product-moment correlation analysis and independent t-test analysis ($p<.05$). The results indicate that a significant positive correlation between persistence and positive encouraging comments from a family member to complete educational goals and positive encouraging comments from a family member to continue in the Dental Assisting Program. These two items indicate a significant difference between graduates and nongraduates on t-test analysis. The results indicate that a relationship did not exist between persistence and negative comments from a family member about going to college and negative comments from a family member making them think about quitting the program. These two items did not indicate a significant difference nongraduates and graduates on t-test analysis.

Overall, the findings produced by the analysis of the environmental variables reveal that persistence for dental assisting students was related to a high frequency of some forms of faculty contact outside the classroom, various peer interactions, and positive encouraging comments by family members.

To further investigate the relationship of faculty contact, peer interaction, and family encouragement, respondents were asked to indicate from a given list the person who hade the most impact on their educational achievement while they were in the Dental Assisting Program. Both graduates and nongraduates indicated that Family Member/Significant Others as the category having the most impact on their educational achievement followed by Dental Assisting Faculty Members and Dental Assisting Classmates.

Respondents were also asked to respond to open-ended items. The first open-ended item asked respondents to indicate other factors that helped them while in the Dental Assisting Program. The graduates indicated Dental Assisting Faculty Member (29%), Peer Group (17%), Family (11%), Classroom Organization (11%), and Employment (11%). The nongraduates indicated Employment (21%), Goal Commitment (18%), Miscellaneous Other, which included facility, exploration of dental field, potential employers, etc. (18%), Dental Assisting Faculty Member (14%), and Family (14%).

The second open-ended item asked respondents to indicate other factors that hindered them while in the Dental Assisting Program. The graduates indicated classroom organization (26%), Dental Assisting Faculty (16%), peers (15%) and family (13%). The nongraduates indicated Dental Assisting faculty (27%), and family (16%), classroom organization (16%), and working too much (16%).

Canonical correlation, Wilks' lambda, and discriminant analysis were used to determine if the environmental variables predict persistence to graduation. The findings indicate that the variability between the two groups on selected background and academic variables was small (16%). The findings suggest that the proposed Model for Community

College Students Who Are At-Risk for Persistence may be useful in predicting persistence to graduation for the Illinois community college dental assisting students who are at-risk. The results indicate that the model predicted correctly 88.6% of the time for nongraduates and 82.1% of the time for graduates. The pooled group prediction score was 84.4%.

## Conclusions

The predictive persistence theory developed by Tinto (1975) posits that the greater the student's social and academic integration into the institution the greater chance he or she will persist. According to Tinto, background variables influence a student's commitment to his or her educational goal, which could affect a student's persistence. Much of this study supports the tenets of Tinto's persistence model. However, several differences were identified in the analysis. Tinto (1975) included the background variables of gender, age, race/ethnic origin, educational goals, enrollment status, high school performance expressed as GPA, hours of employment, finances, and family responsibilities as influences on a student's commitment to his or her educational goal, which could affect a student's persistence in college. This study found no significant difference between graduates and nongraduates on gender, race/ethnic origin, educational goals, high school performance, or family responsibilities, which demonstrates a lack of support for Tinto's theory of persistence. However, the study found a significant difference between graduates and nongraduates on age, enrollment status, hours of employment, college GPA, and finances, which demonstrates support for Tinto's theory.

The study concluded that gender was not significant. Bean and Metzner (1985) posited that gender plays a role in persistence because a greater number of men graduate from degree programs as compared to women. However, due to the high percent of women in this study, this contention was not substantiated by the findings.

In the study, nongraduates tended to be significantly older than graduates. This finding substantiates a previous study conducted at a two-year college in Georgia by Greer (1980) which indicated that nontraditional age students have a higher nonpersistence rate as compared to traditional age students. The findings of this study also refute the earlier comprehensive literature review of primarily four-year institutions by Pantages and Creedon (1978), that concluded age of college students was not a significant factor in college persistence.

Race/ethnic origin was concluded to have no significant influence on persistence. This substantiates findings from former studies by Peng and Fetters (1978), Brunner, Packwood, and Wilson (1978), Pascarella and Terenzini (1980), Munro (1981), and Pascarella, Duby, and Iverson (1983).

The study concluded that enrollment status played a significant role in the persistence rate of the respondents. A significantly higher number of graduates were attending full-time as opposed to part-time. This supports a study by Brunner, Packwood, and Wilson (1978) whose findings revealed that full-time students were five times more likely to persist in college than part-time students.

The study determined that high school academic performance did not significantly influence persistence. The finding did not substantiate the contention by Tinto (1975) and Bean and Metzner (1985) that high school academic performance is a predictor of college persistence. Previous research at four-year institutions by Pascarella and Chapman (1983) found that high school performance significantly influenced persistence, thus supporting the contentions of Tinto (1975) and Bean and Metzner. However, this research on community college dental assisting students who are at-risk did not, supporting this author's basic contention that such students have unique characteristics as compared to students who attend four-year institutions.

Hours of employment had a significant relationship with persistence for the respondents. The study demonstrates that nongraduates worked more hours than graduates. The findings support the research of Hunter and Sheldon (1980) and Pantages and Creedon (1978). Both studies indicated that students who worked more hours were less likely to persist. Hunter and Sheldon further concluded that students who work in excess of 20-25 hours were highly linked to nonpersistence. In this study, 50% of the nongraduates worked over 25 hours per week compared to 28% of the graduates. Therefore, the findings of this study support the conclusion by Hunter and Sheldon that students who work more than 20-25 hours per week are less likely to persist to graduation.

More graduates received financial aid compared to nongraduates and this difference between the groups on receipt of financial aid was found to be statistically significant based on chi-square analysis. This possibly suggests that students who receive financial aid may not have to work as many hours and should have more time to interact with their peers and discuss topics outside of class with faculty members, thereby leading to higher persistence. The contention that receipt of financial aid leads to more contact with faculty member and peers was supported in a study performed by Cabrera, Nora, and Castaneda (1992) that indicated that students receiving financial aid were more likely to engage in increased social interactions with college peers and faculty members, leading to better social integration and greater college persistence.

The background characteristic of parents' education was found to not influence persistence, contrary to an earlier study by Skaling (1971) which indicated that parents' education level was a good predictor of persistence of traditional age college students. This finding supports the contention of Bean and Metzner (1985) that parents' education does not influence persistence and, therefore, it was not included in their model for persistence. However, Cross (1981) felt that because many nontraditional age students were first generation college students, college persistence may be affected by the education level of the parents. Nonetheless, this study did not support Cross's contention either.

The study indicates that for family responsibilities, more nongraduates were married and were more likely to have dependent children living with them than their counterparts. However, this difference was not significant. This result does not substantiate studies by Reehling (1980) and Hunter and Sheldon (1980) showing increased family responsibilities were significantly linked to nonpersistence.

In this study the college GPA mean for graduates and nongraduates was 3.32 and 3.03, respectively based on a four-point scale where a 4.0 equals an A. Both group means were indicative of a B average, suggesting nontraditional age students did not leave college because of poor academic performance. This result supports the findings of a study by Greer (1980), showing, although older students had high grades, they had a high nonpersistence rate as well.

Remedial education has not been seriously considered for its impact on persistence and is not included in the well-tested models of college persistence (Bean & Metzner, 1975; Pantages & Creedon, 1978; Pascarella & Terenzini, 1991; Tinto, 1975). Remedial education was included in this study because of its widespread use with community college students, contributing a new dimension to the persistence literature for this particular population. The dental assisting students who had taken and passed remedial English and remedial math courses were significantly more likely to graduate than those who did not take them. However, remedial reading and study skills courses showed no significant difference between graduates and nongraduates because only a very small number of students in either group took such classes in the first place. This result may support an earlier study on student persistence at Sinclair Community College (1994), which concluded that students who took all of the recommended remedial courses persisted in school longer than those students who took only part or none of the recommended courses.

Results of the study concluded that students who received a high frequency of faculty contact and peer interaction were significantly more likely to persist to graduation. This result supports Tinto's theory (1975) that informal contact with faculty members and peer interaction leads to more complete social integration into the institution, which leads to a higher rate of persistence to graduation. The persistence model developed by Bean and Metzner (1985) places a low priority on social integration into the institution because community college students are primarily commuter and have less time to socialize with peers and faculty outside of class. However, this study demonstrates the importance of social integration to a persistence model for commuter community college dental assisting students who are at-risk as well.

The findings of the study indicate that positive family encouragement toward goal completion was significantly linked to persistence to graduation. This result supports part of the findings of a study performed by Williams (1994) that found family encouragement was essential to survival in college. The same study by Williams also indicated that negative comments from family members were equally as detrimental to persistence to graduation. However, in this study, negative comments from family members were not related to persistence.

## Implications

The findings from this study reveal the persistence of community college students who are at-risk were affected by certain background and academic variables. Additionally, this study concludes that for community college dental assisting students who are at-risk, certain environmental variables made a significant difference to persistence. Based on the findings and conclusions of this study the following implications are presented:

1. Community college Dental Assisting Program faculty members should carefully design opportunities to be available to students for one-on-one communication. The study indicates that graduates were significantly more likely than nongraduates to talk with instructors outside of the classroom concerning their academic progress and topics from class. They were also more likely to talk about nonschool issues and socialize with instructors outside of the classroom. Nongraduates tended to be older, were more likely to attend part-time, have more family responsibilities, and work substantially more hours than graduates. Nongraduate may have viewed the opportunities to seek attention from faculty members outside the classroom as limited. In order to counteract this perception, community college dental assisting faculty members need the skills to understand the complexity of the unique problems of students who are at-risk. Faculty members need to be made aware that some students have persistence problems and that there are certain techniques that they could use to facilitate more one-on-one interaction with the students. For example, students could be required as part of their course assignments to have

periodic appointments with the faculty member after class. To ensure that faculty members have the skills and understanding to help students who are at-risk, institutions should support continuing professional education or advanced graduate education designed to enhance faculty members' understanding of student persistence problems.

2. Community college faculty members need to create a classroom environment that encourages peer interaction. The study indicates that community college students who studied with their peers, talked to their peers about school or personal problems, and socialized with their peers outside of school, were significantly more likely to graduate. However, again the study indicated that nongraduates tended to be older, were more likely to attend part-time, have more family responsibilities, and work substantially more hours. These students may not have had the opportunities to develop relationships with classmates outside the classroom. To foster peer interaction, faculty members need to create classroom environments and utilize teaching methods that engage students in group activities, thus encouraging them to get to know each other early in their educational experience. To ensure that faculty members have the skills to facilitate this type of classroom environment, community colleges should support continuing professional education or advanced graduate education designed to teach faculty members how to utilize and implement group learning in the classroom.

3. Community colleges should establish peer mentoring programs. Talking to peers about school-related and personal problems were found to be significant in this study. Peer mentoring programs can provide opportunities for peers to talk outside of class. Many students who attend school on a part-time basis and/or work or have family responsibilities may not have time to establish peer relationships through the classes they are taking. With a peer mentoring program, students could be assigned to a student mentor, providing them immediate access to a peer who is available to answer questions. To ensure that the peer mentoring program is developed and administered to achieve the goal of higher student-peer interaction, the community college should have a committed director for the peer mentoring program and provide ample support (monetary and otherwise).

4. Community college faculty members should provide counseling to students on the impact of family encouragement to college persistence. The study indicates that community college students who received family encouragement to complete their educational goals and to continue in the Dental Assisting Program were significantly more likely to graduate. Faculty members need to be made aware that students' persistence may be affected by family encouragement. Then, faculty members should counsel the students on how family encouragement may affect them. To ensure that faculty members have the skills and understanding to help students who are at-risk, institutions should support continuing professional education or advanced graduate education designed to enhance faculty members understanding of student problems and to gain counseling skills to better deal with them. Additionally, institutions should employ qualified counseling staff members who are available to help advise faculty members on appropriate counseling techniques.

5. Community colleges should require all students to be tested in English and math proficiency and remedial courses should be mandated before students enter an occupational program. The study concludes that community college dental assisting students who took and completed remedial English and remedial math courses were significantly more likely to graduate. Therefore, community college Dental Assisting Programs should establish a basic skills proficiency level that must be achieved before students could enter an

occupational program. This would require students, who were not proficient in English, math and other basic skills such as reading and study skills, to take and complete remedial courses as needed.

6. Policymakers at the federal, state, and local levels should support financial aid for students who are at-risk for persistence. The receipt of financial aid made a significant difference to persistence of the students in this study. If financial aid is threatened or reduced, students may be adversely affected. For instance, if financial aid is reduced students will have to work more hours. Findings from this study demonstrated that dental assisting students who worked were less likely to graduate. Therefore, policymakers must ensure availability of financial aid to students who are at-risk so they have time to invest in college.

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# STUDENT PERCEPTIONS ABOUT APPLIED MATHEMATICS

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## Introduction

Instruction in applied academic courses, including mathematics, has received increased attention as a part of Tech Prep initiatives as well as other efforts to restructure the delivery of education in our schools. The SCANS (1991) report, Tech Prep, Title III of the Perkins Vocational and Applied Technology Education Act (1990) and initiatives related to school to work all suggested the need to restructure education to better develop the skills needed to enter the increasingly complex work place. Students must not only understand basic concepts but how to apply them to real world problems (Marshall & Tucker, 1992). Recent work in cognitive psychology about how people learn has also suggested the need to explore alternate approaches to facilitate student learning (Resnick & Klopfer, 1989).

The Tech Prep initiative has encouraged curriculum reform including the teaching of applied academic courses. This is consistent with the three foundation principles that Hull & Parnell (1992) identified for Tech Prep. The related principle stated that students will learn better when courses are taught in a real-world context. Under Title III of the Perkins Act, Tech Prep must, among other things, build student competence in mathematics, science, and communications through a sequential course of study; and lead to employment placement (Brustein, 1993). A recent study by Bragg, Layton, & Hammons (1994) examined local Tech Prep implementation in the United States. Of the seventeen outcomes, the top three were: "improved knowledge and skills in math; increased problem-solving, thinking, and reasoning skills; and improved employability skills and work readiness" (p. 50).

In a national study of the evaluation of Tech Prep activities, Custer, Ruhland, & Stewart (1995) found that "a major thrust of Tech Prep has to do with developing and implementing processes for restructuring schools and instituting fundamental changes in the way that education is delivered in America. This is related to national as well as local initiatives, such as the association with the broader range of educational reform that is occurring across the nation" (p. 14).

Tanner & Chism (1996) reported on a study of applied math student performance in Georgia. They compared the results of students taking applied math 2 and algebra 1 on the SAT-M using scores on the Iowa Test of Basic Skills as a covariant. They found that the students in applied math made significantly higher scores on the SAT-M. The Center for Occupational Research and Development (CORD, 1994) also reported no significant differences in scores of applied math 2 and algebra 1 students on a researcher developed instrument designed to assess algebra skills.

The applied mathematics approach differs from traditional math courses. The traditional approach most often presents concepts with practice problems. Little attention is given to application. The applied curriculum is structured to present concepts in context to real-life events. Activities that bring abstract ideas into concrete, hands-on activities are foundational. Applied course activities are designed to reflect a psychological framework of associative learning and learning style preferences. Balsam (1985) stated, "learning occurs in a cognitive or associative context of what has been learned before and in an environmental context that is defined by the location, time, and specific features of the task at hand" (p. 1). Context improves the learning process by allowing relationships to be drawn among associated components.

Several early psychologists emphasized the importance of association in learning (Guthrie, 1935, Hull, 1943; Thorndike, 1931). The structure of these traditional theories consisted of an association between two elements. Current cognitive theory differs from these early educational psychologists. Biggs, Hinton & Duncan (1996) stated, "learning is a process of knowledge construction rather than knowledge absorption and storage; people use what they already know in constructing new knowledge; and learning is closely related to the context in which it takes place" (p. 35).

In addition to contextual and associative learning theories, recent work on the individual learning preferences of students is important to the overall cognitive development of individuals. Applied mathematics assumes that students learn in differing ways. This idea of differing learning preferences is often called learning styles. Researchers have concluded that people learn in different manners and rates. The idea that individuals comprehend, order, and synthesize concepts in differing manners and rates is the premise of learning styles. Lewis & Steinberger (1991) explained that learning style is the characteristic cognitive, affective, and physiological behaviors that serve as relatively stable indicators of how learners perceive, interact with and respond to the learning environment. Numerous studies have confirmed that the majority of students can accomplish a task given in an educational environment that matches or compliments their learning style preference (Drummond, 1987; Dunn & Dunn, 1978; Kolb, 1984; Messick, 1984; Pumipuntu, 1992).

An emphasis on context as it relates to facilitating student learning is supported by cognitive theory. Recent sources provided information about theory and its impact on learning (Raizen, 1989; Thomas, 1992; Jones, 1992; Thomas, Johnson, & Anderson, 1992). Resnick & Klopfer (1989) suggested that skill and content should be taught at the same time and that students should be provided experiences using real tasks to provide an opportunity for contextualized practice. The work of cognitive psychology and learning style theories provided a theoretical base for this study. This research study was conducted with a foundational assumption that learning is greater for many students when methods accommodate active involvement and differing learning preferences and that the perceptions of students about the subject will be influenced by cognitive success.

Many educators believe that students in applied courses learn more and have greater interest in the subject matter. Therefore, there is increased interest in offering more courses taught using an applied approach. The bulk of recent research has centered around instructor perceptions and concerns about applied academics (Bristow, 1994; Dennison, 1993; Greene, 1993; Kelly, 1993; Pollard, 1990). It was unclear just how effective the *Applied Mathematics* curriculum is in promoting positive perceptions about math as a subject. With positive reports from teachers, students, and administrators, a study to determine the effect of these courses on student perceptions was warranted.

## Purpose of Study

The purpose of this study was to examine the perceptions of students enrolled in applied mathematics 1 and applied mathematics 2 courses based principally on the Center for Occupational Research and Development's *CORD Applied Mathematics* curriculum with any teacher supplemented material philosophically aligned with the CORD methodology. The specific objective was to compare the perceptions of students in applied math and algebra 1 about mathematics as a school subject.

## Methods

This quasi-experimental study employed a posttest-only control group design to examine the perceptions of students in applied mathematics and algebra 1 courses. A posttest-only design was used to avoid pretest treatment interaction and the regression problem associated with gain scores (Gay, 1992). Students in algebra 1 were used as a control group to provide a means of comparison, because the applied curricula were developed to provide algebra skills. Cluster sampling was used with random selection of intact classes.

Four Missouri school districts received a state-funded grant in 1993 to fully implement an Applied Mathematics curriculum based on the 36 units from CORD (1993) as well as three other applied courses. The districts each offer applied math 1 courses, applied math 2 courses, as well as algebra 1 and other advanced math courses. Schools from these districts were selected to provide data for this study. Twenty-six of 67 randomly selected class sections of applied mathematics and algebra 1 in the four Missouri districts were used to provide data for 490 students. Complete sets of data were obtained from a total of 254 subjects. The number of data sets was reduced due to missed tests, data available on the covariant tests, and student attrition and transfers. The data sets included scores on *the Work Keys Applied Mathematics* test, the Pre-Algebra/Algebra subscore of the Mathematics portion of the P-Act+ which were reported in another study (Keif & Stewart, 1996), the Math Perception Survey, and a demographic survey. Eighth-grade MMAT Math and Reading scores were also obtained for each subject.

The group-administered Math Perception Survey was modified from the Purdue Master Attitude Scale Toward Subject Matter by Remmers (1934). The 7-point Likert scale uses brief statements in both positive and negative form that require the subject to select an answer ranging from Very Strongly Agree to Very Strongly Disagree. Mean scores could range from one to seven.

Modifications of the instrument included replacing the words "subject matter" with "math". The twenty item scale was shortened by McCaskey (1987) from the original 90 items. The shortened version of the Purdue Master Attitude Scale yielded a Cronbach's Alpha estimate of internal consistency of .95 throughout this study. McCaskey (1987), likewise, reported a .95 internal consistency during his study.

An instrument was developed for this study to gather descriptive data about the participants. These data were used to provide a basis for assessing homogeneity among groups. The group-administered student information survey was used to collect information about grade, previous math success, class assignment, and intentions after graduation.

Data were collected in late April 1995 as students completed course requirements. School counselors then supplied coded individual mathematics and reading scores on the state mandated Missouri Mastery Achievement Test (MMAT) given to all eighth grade students. The MMAT was selected to provide performance data because it was the only test providing a common data base among the four schools.

The General Linear Models (GLM) analysis of variance procedure was used throughout the study in lieu of standard analysis of variance because of the unbalanced design. All data analyses were performed by computer using a SAS statistical package (SAS Institute Inc., 1989). Data for the objective were analyzed using the GLM analysis of variance procedure. The related hypothesis was tested at the .05 alpha level. The least square means procedure was used for post hoc analysis.

## Findings

Descriptive data and eighth-grade MMAT scores were examined to ascertain profiles of students in the three classes. Most (224) of the students were in either grades 9 or 10. The composition of the groups was 58% male for applied math and 56% female for algebra 1. When asked which best described their last math class, nearly half of the students in applied math 1 responded 8th grade general math. However, 76% of the students in algebra 1 selected pre-algebra/algebra (see Table 1).

Table 1

Percentage of Students Reporting Last Math Class in which Subjects were Enrolled

| | 9th/10th grade general math | Applied math 1 | 8th grade general math | Pre-algebra algebra |
|---|---|---|---|---|
| Applied math 1 | 8% | 8% | 46% | 38% |
| Applied math 2 | 7% | 61% | 0% | 32% |
| Algebra 1 | 2% | 4% | 16% | 75% |

Students also reported the grades usually received in math class. As reported in Table 2, algebra students reported higher grades in previous classes.

Table 2

Percentage of Students Reporting Grades Received in Math Class

| | A's | B's | C's | D's/F's |
|---|---|---|---|---|
| Applied math 1 | 9% | 35% | 47% | 9% |
| Applied math 2 | 7% | 46% | 39% | 7% |
| Algebra 1 | 23% | 42% | 25% | 10% |

Eighth-grade Missouri Mastery Achievement Test (MMAT) scores in reading and mathematics were a significant component of the data sets. These scores were obtained from counselors at the schools. The mean MMAT math score for students in applied math 2 was 299 while the mean MMAT math score for students in algebra 1 was 372. Similarly, the mean MMAT reading score for students in applied math 2 was 294, while the mean MMAT reading score for students in algebra 1 was 331 (see Table 3).

Table 3

Group Means of Eight Grade MMAT Reading and Mathematics Scores

| | Mathematics | Reading |
|---|---|---|
| Applied math 1 | 287 | 286 |
| Applied math 2 | 299 | 294 |
| Algebra 1 | 372 | 331 |

The objective was formulated to determine if the level of student perception about mathematics as a school subject differed among students in the three types of mathematics classes. A GLM analysis of variance procedure was performed on the perception data of the three groups. The mean score for students in applied math 1 was 4.61. The mean score for students in applied math 2 was 4.63. The mean score for the students in algebra 1 was 4.89. There was no significant difference (F=2.05,p=.13) among these scores at the .05 alpha level.

## Implications

It was concluded that students completing applied mathematics 1 and students completing applied mathematics 2 possess comparable perceptions toward math as a school subject as students completing algebra and instruction based on the *CORD Applied Mathematics* curriculum is useful for students who learn using applied, activity-centered approaches.

The results of this study are important to educational decision makers as they judge the success and value of courses emphasizing an applied or contextual approach. The evidence suggests the applied courses provide for positive perceptions about mathematics as a subject. The use of real world examples and the activities provide a basis for students to develop an appreciation for the use of mathematics on the job.

The results of this study lead to several areas of discussion. Isolating curriculum and instructional strategies in educational research is very difficult because of external factors such as class selection by students and previous experience in mathematics. As such, statistical control and qualitative judgments were necessary to aid in interpreting the findings.

Many teachers were excited about the interest and progress that students displayed using the applied approach. It was difficult, however, to relate these observations directly to student perception data because of confounding variables. A concern raised early in the study involved the entry skills of students enrolling in applied math. Use of 8th grade Missouri Mastery Achievement Test (MMAT) scores in reading and math provided information about entry skills. While students in applied courses had not been as successful in learning math skills, their perceptions about mathematics as a subject was positive and similar to those of algebra students.

Personal interviews with teachers revealed a renewed interest in math among students in applied mathematics classes. Therefore, the similar perceptions may have been influenced by the contextual nature of the applied classes and the success realized by these students.

The comparable perceptions about math that was found for the applied mathematics groups when compared to the algebra 1 group may well be attributable to the contextual approaches based on the learning theories described in the theoretical base section. The *CORD Applied Mathematics* curriculum provides for a hands-on approach that actively engages the learner. Specific activities such as popping corn and calculating the percent of popped kernels may be used as contrasted to a traditional approach of working problems from a guide sheet. Applied learning proponents frequently mentioned that some students truly comprehend only after active participation. For some, construction in the classroom through psychomotor means precedes construction in the cognitive. These students often prefer to learn through hands-on, activity centered projects like those used in applied math.

Educational leaders as well as local school districts should be better prepared to make informed decisions concerning the use of applied mathematics courses. The positive perceptions of students in these courses has been documented, providing decision makers additional information needed to help derive reasoned conclusions about the role of contextual approaches in education.

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# WORK-BASED LEARNING: STUDENT PERSPECTIVES ON QUALITY AND OUTCOMES

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## Abstract

Programs that incorporate work-based learning (WBL) experiences in connection with school activities are proliferating, yet we know little about their quality as learning experiences for young people or the costs associated with participating in them. This paper examines two programs operating in the same school district, where students receive course credit for participating in WBL. One program provides unpaid internships each year of high school; the other paid work experience for one semester. We contrast the kinds of learning opportunities each offers to students, as measured by a student survey and a case study of program operations. We explore the features of the program that support connections between WBL and school learning, the quality of students' work experiences, and the effects of program participation on schooling and social experiences. We find that students perceive the quality of their work experiences to be very similar across the programs, despite differences in the type of work involved and in several structural features of the programs. We find that the number of hours students work negatively affects some aspects of school performance, such as having time to do homework, and the desire to stay in school. Both programs have weaknesses in establishing connections between school and work, which raises questions about the value-added of WBL, given costs associated with program design and delivery and, in some cases, with participation.

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## Introduction

Work-based learning (WBL)—learning that is planned to contribute to the intellectual and career development of high school and community college students—is gaining broad acceptance by policymakers and educators as a means to improve educational outcomes for many students. For example, the School-to-Work Opportunities Act (STWOA) of 1994 provided funds for states and localities to develop or expand programs that specifically include a WBL component; these new programs join a variety of existing initiatives that utilize WBL, such as cooperative education, career academies, and youth apprenticeships. However, despite the proliferation of WBL programs, very little is known about their quality and effectiveness, or how they compare to regular youth jobs which are unconnected to school (OTA, 1995). Similarly, little research has addressed the experiences of students in WBL, and the ways these contribute to, or hinder, students' intellectual or occupational development (Stern et al., 1990; Stone et al., 1990).

In this paper we present some new evidence drawn from a study of different types of WBL programs for high school students operating in a large metropolitan area. We focus on two programs: (1) a Medical Magnet High School (MMHS) that provides unpaid internships each year of high school, and (2) a Work Experience Program (WEP) that provides paid work experience for one semester. We contrast the kinds of learning opportunities each offers to students, as measured by a survey of student participants and by in-depth case studies of program operation. We use these data to explore three aspects of WBL programs: (1) the features of the programs that support WBL, especially the links between school and work; (2) the quality of the work experiences afforded the students; and (3) the effects of each program on students' schooling and social experiences. While previous studies of WBL programs have focused on employment outcomes for students (e.g., Stern et al., 1997), we are more interested in other outcomes, such as the extent to which students believe their participation in WBL affects or conflicts with their school performance, makes use of their skills, and promotes learning about careers or specific work skills (e.g., working in teams). We present various statistical analyses of student survey items to compare and contrast the programs, and integrate our qualitative case study data into our discussion.

We find that the students perceive the quality of their work experiences to be very similar across programs, despite a contrast in the type of work involved, and in several structural features of the program design. On the other hand, there is a marked difference between the two programs in the relationship to school. In the paid internships, where students are working a large number of hours, there is some evidence of negative effects on students—for example, they have less time to do homework and are more likely to want to quit school. Both programs have only weak mechanisms for linking school and work, which raises questions about the value-added assumptions behind WBL, particularly if time at work conflicts with school.

## Background and Approach

School programs that incorporate WBL come in many variants, but have the common goal of providing participants with some experience in the world of work. It is believed that hands-on workplace experience will provide students with opportunities to learn work-related skills and attitudes they could not otherwise acquire in a classroom. In addition, WBL may increase their prospects for future gainful employment (Stern et al., 1997). What actually happens at the worksite—in terms of the type of work performed—and the way the program is structured to promote links between school and work, are crucial aspects of ensuring a WBL program meets its goals. Hence, in this paper, we are primarily interested in two broad issues: (1) in what ways and to what extent WBL programs provide students with quality opportunities to learn about work; and (2) in what ways and to what extent WBL activities link to, or conflict with, schooling. Before describing our data which shed light on these questions, we briefly discuss some pertinent background literature.

Previous research on work, job characteristics, and human development provides a conceptual framework for examining the quality of work experiences provided by WBL programs. Kohn and Schooler (1978) defined "substantive complexity" as one indicator of job quality, which they defined as complexity of reading and writing required, working with one's hands, and dealing with people. Stern and his colleagues (1990) expanded this construct to include cognitive complexity (e.g., use of reading, math, and writing on the job), mental challenge, physical challenge, and opportunity to develop work-related social competence. The development of work-social competence is important because it is related to a person's capacity to perform successfully at work (Mainquist and Eichorn, 1989). WBL quality, then, can be assessed by looking at specific job characteristics.

A previous study of cooperative education in high school and community colleges developed student survey items to assess the nature of work experiences (Stern, Hopkins, Stone, and McMillion, 1990; Stone, Stern, Hopkins, and McMillion, 1990). This study identified several relationships between job quality and students' orientation toward work. Opportunity to learn and physical challenge are positively related to students' motivation to do good work. Students who report less conflict between school and their jobs express more motivation and less cynicism about work (Stern et al., 1990). Compared to students in non-supervised work experiences (i.e., regular youth jobs), students in supervised work experiences appear to have higher-quality jobs where students make greater use of academic skills, have more contact with adults, and have opportunities to learn problem solving and responsibility (Stone et al., 1990).

In addition to job quality itself, WBL should relate to and enhance school learning. Otherwise, students can presumably gain valuable work-related skills and attitudes working in any youth job. Since youth jobs are plentiful on average—in 1992, 80 percent of high school seniors worked for pay outside of school—there would be no need to develop and deliver programs that provide WBL unless they add value to schooling (U.S. Department of Education, 1992).[1] In considering the relationship between WBL and school, two factors are relevant. On the one hand, if WBL is a time-intensive activity, it is possible that students' academic performance may suffer—they may have less time to do homework, may be tired or late for class, may take fewer courses, and may have lower grades (Greenberger and Steinberg, 1986; Stone et al., 1990). On the other hand, WBL may have positive effects on school by providing students a context for understanding how skills learned in school are useful and important in work. This understanding might enhance school learning, if students are given the opportunity to apply "academic" skills on the job, or vice versa. WBL might engage students who are otherwise uninterested in school and motivate them to stay in school. WBL may provide important information about jobs and careers that students cannot otherwise obtain, which can in turn affect their course of study and decisions to pursue higher education.[2]

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[1] Although, on average, the majority of high school students find employment, employment rates differ for different groups. In 1992, for example, 24 percent of high school students aged 15-24 were working, but white students were twice as likely to be working as minority students (U.S. Department of Commerce, 1992). Some programs, including one in our study, are specifically designed to provide work experience for minority youth because real opportunities in the community are scarce. In this context, WBL may have value in providing work for experience alone, irrespective of its relationship to school In addition, conventional wisdom characterizes youth jobs as low-level "McJobs" which do not afford students the opportunity to gain higher-level skills that might enhance their overall employability. Studies that closely examine the quality of youth jobs in comparison to school-supervised work experiences, however, have not been conducted.

Whether we are interested in WBL quality alone or in the relationship between school-based and work-based learning, the structure of the program is an important consideration. When students engage in WBL, the learning opportunities afforded to them are primarily defined by the characteristics of the work and workplaces. Teachers or educators involved in these programs must collaborate with individuals at the worksite to help ensure that students' experiences are productive and worthwhile, and that students are not being exploited. In order for WBL to be educationally beneficial and to enhance or complement school-based learning—two primary reasons for offering WBL in the first place—the school and worksite must coordinate program design and delivery in detail. Previous studies show that a coordinated effort enhances the use of academic skills on the job, promotes better quality supervision, and provides work experience that is both more challenging and more meaningful (Stone et al., 1990). Stern et al. (1997) conclude that a more challenging experience which offers the opportunity to learn and makes greater use of the students' skills is a significant determining factor of student attitudes toward work. The degree of coordination between school-based and work-based learning can be assessed by considering the presence or absence of several desirable features, including: a written training agreement, a written training plan, supervision of students' work placement by teachers or program staff, release time for teachers to visit students on site, teachers or program coordinators having responsibility for finding placements, and class grade depending on the achievement of work objectives (Stern, 1992).

## Methods and Data Sources

In this paper, we report analyses of two contrasting WBL programs for high school students.[3] Our findings are based on in-depth case studies of these programs, which included interviews with program staff and a student survey, based on the instrument developed by Stern et al. (1990). While a self-report survey has limitations for assessing WBL quality—particularly the social context of work in which learning takes place—it seemed a useful way to gather systematic data from participating students where little information currently exists. While our survey is adapted from previous work, our study differs by explicitly examining program-level variations in WBL and by incorporating qualitative data from the individual case studies. In this way, we can attempt to see whether program design affects the quality and outcomes of WBL as perceived by participating students.

**Survey.** The student survey consisted of 50 primarily closed-choice items. It was administered in groups and took approximately 30-45 minutes to complete. The items covered students' background (gender, age, grade, ethnicity, language spoken at home);

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[2] See OTA (1995) for further discussion on the various rationale in support of WBL.

[3] The larger study from which this paper is drawn includes four programs. In addition to student surveys and interviews, we observed a few students from each program on the job. Forthcoming papers will use these case studies to examine the social context of work-based learning and work quality in more detail.

general feelings about school; higher education and career aspirations; previous and current work experience outside of school-sponsored work; and work experience associated with the particular program. The latter category included detailed questions about the nature of WBL, including skills used and learned on the job, training and supervision, and relationships between school and work.

Active parental consent was obtained for students to complete the anonymous survey during spring semester 1996. The consent requirement necessarily reduced the response rate, as students had to take forms home to obtain a parent's signature and return them to school. Survey data are available for 55 juniors and seniors in the Medical Magnet High School (about one-third of students enrolled in those grades), and for 44 juniors and seniors in the Work Experience Program (which had about 55 students enrolled during that semester).[4]

**Interviews and Documentation.** To gather information about the design and delivery of the programs, we interviewed program staff, school personnel connected to the program, and selected employers and workplace supervisors or mentors. All respondents were asked general questions about program goals, perceived student outcomes, and the like, and specific questions tailored to their roles and responsibilities in each program. Interviews were confidential and lasted approximately one hour. At WEP, we interviewed the program manager, program coordinator, two teachers, a school counselor, and two employers who provided work for participating students. At MMHS, we interviewed the school principal, program coordinator, two employers, and a worksite mentor. We also learned about the program by gathering and studying various documents, such as program descriptions, guidelines and criteria for participation, mentor guides, training contracts, student evaluation forms, and so on.

**Program Overview.** The two programs discussed in this paper operate in the same large, metropolitan school district and serve similar populations of students. The first program, a Medical Magnet High School (MMHS),[5] provides unpaid internships in a variety of medical settings. The school emphasizes a college-preparatory curriculum for grade 10-12 students, with internships primarily provided for the purpose of career exploration. Tenth-grade students rotate in several placements for one morning a week throughout the school year. Juniors and seniors work one morning per week in one or two settings for the year; some students are hired to work in the summer as well. Students receive elective course credit for their intern work.

The work experience program (WEP) loosely follows the cooperative education program model and is a partnership between the school district and a large multinational company. WEP provides paid work experience and course credit for program participants drawn from eight urban high schools in the same district. Students can enroll for one semester. They work up to 16 hours per week and attend class for four hours per week at the WEP site. The primary purpose of this program is to develop students' academic and occupational skills through paid work experience.

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[4] These small samples sizes prohibit all but the most limited multivariate analyses. We did not detect any particular non-response bias, except MMHS staff noted that some seniors, who were preoccupied with graduation festivities, did not choose to participate. In addition, the sample of WEP students includes a few who participated during Fall semester 1995, who were present at the program site when the surveys were administered, and who were old enough to provide their own consent.

[5] For purposes of confidentiality, the names of the programs are anonymous.

As we discuss further below, these programs vary along several dimensions: whether work is paid or unpaid; the length and variety of work-based learning opportunities; and whether work is a primary or secondary focus. These and other differences make the two programs useful for examining important questions of interest to policymakers and practitioners, such as the quality of student work experiences, the links between school and work, and the impact of work on school performance.

Table 1 summarizes the characteristics of students who completed the survey. Both serve primarily non-white populations, and for similar proportions of students, English is not the primary language spoken at home.

Students in both programs responded similarly when asked some general questions about school and their future aspirations. Students generally like going to school: about 60 percent in each program like it very much (marked 4 or 5 on a five-point scale, where 5 = "like school very much;" mean ratings 3.77 (0.77) and 3.76 (0.84) for MMHS and WEP, respectively). MMHS students were a little more likely than WEP students to say that schoolwork is meaningful and important (mean ratings 4.01 and 3.91, respectively, where 5 = "almost always"), and a little less likely to feel that school learning would be important in later life (mean ratings 4.13 (0.75) and 4.30 (0.98), respectively, where 5 = "very important"). Students in both programs had high educational aspirations. Eighty-six percent of MMHS students wanted to achieve a B.A. degree or higher, compared to 76 percent of WEP students. Most students in both programs were "very sure" that they would reach their educational goals (57 percent of MMHS students; 64 percent of WEP students).

**Table 1**
**Characteristics of Students**

| | MMHS (N = 55) | WEP (N = 44) |
|---|---|---|
| Percent male | 24 | 41 |
| Percent senior | 31 | 89 |
| Ethnicity | | |
| Caucasian | 0 | 0 |
| African-American | 67 | 71 |
| Latino | 19 | 26 |
| Native American | 0 | 2 |
| Other | 7 | 0 |
| Percent English spoken at home | 70 | 73 |

## Results

This section summarizes the key findings of the comparative analysis between WEP and the MMHS. We first discuss in more detail how the programs deliver WBL and what kinds of work experiences they provide. Then we compare the quality of their work experiences, as perceived by students. We next focus on the relationship of the WBL to school, and assess the extent to which the work experience conflicts with or enhances their school program.

### (1) Program Operation and Nature of Work Experiences

As mentioned earlier, the two programs show marked differences in some important dimensions—whether work is paid or unpaid, the relative emphasis of school versus work, and the length, number, and type of work experiences available. The programs are similar however, in other important respects. Table 2 summarizes some important features of the programs.

Table 2
Selected Characteristics of Programs

| | MMHS | WEP |
|---|---|---|
| Primary program focus | College preparation | Acquire employability skills |
| Purpose of work experience | Career exploration | Acquire work experience |
| Wages | Unpaid internships; summer employment for a few students | Paid employment |
| Length of work experience | One morning a week over several years | Up to 16 hours per week for one semester only |
| Type of work sites | Medical focus; hospital department, clinics, university labs | Primarily private sector, service, and retail establishments |
| Student selection | Students assigned to magnet school by lottery | Students at participating schools screened by counselor and program coordinator |
| Written training plan agreements | Student learning objectives | Contract with employers specifying wages/hours |
| Mentor training | No | Available, but not mandatory |
| Supervision at worksite | Teachers check attendance | Teachers meet with students/work supervisors |
| Written evaluation by work site | No | Yes |
| Work performance linked to grades | Yes—student journals | Yes—supervisor evaluations |
| Program identifies placements | Yes | Yes |

**Origin.** The programs have very different origins, which partly explains their difference in the relative emphasis between school and work. The MMHS opened in 1982 through the efforts of a local medical university faculty who wanted to increase the number of minority youth pursuing health-related careers. They started the program at a local high school with a foundation grant, then lobbied the school district to support it as part of their magnet high school program. In the 1996 school year, MMHS enrolled 220 students in grades 10-12. MMHS was initially at a local high school, but now occupies space next to the medical university. According to the principal, one reason for this move was to preserve the school's college-preparatory focus. The administrators at the original host high school wanted the program to provide work experiences that might help students prepare for entry-level work right after graduation.[6] MMHS administrators, however, did not want to run a "vocational" program—they felt that the students should, first and foremost, be preparing for college, whether they ended up pursuing a health-related career or not.[7] Over the years, MMHS established a reputation for excellence: state and district evaluations consistently rank it as one of the best schools in the state. In 1994, their graduation rate was 98.9 percent, with 90 percent of students going on to college.

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[6] In this school district, many of the magnet schools are housed at regular high school campuses.

The WEP program was established in 1993 as a partnership between the school district and a multinational corporation. The company lost several business establishments during the 1992 civil unrest in Los Angeles and decided to make direct investments in the community in order to improve its image and to continue doing business successfully. They established several programs, including WEP. They initially invested two million dollars to begin the program—primarily to build a facility from which the program would operate—and they spend about $500,000 for the program's annual operation. The stated goals of the program are to develop the academic and occupational skills of eleventh- and twelfth-grade students living in Central and South Central Los Angeles, to integrate academic and vocational curriculum, and to provide work-based learning sites for students. The program began in February 1993; by 1996, 445 students completed the program. From the beginning, this program emphasized paid work experience for students, combined with four hours of classroom instruction at the WEP site per week. Students earn from $4.50-$6:00 per hour; the company subsidizes 50 percent of the students' wages.

**Selection.** MMHS does not choose its students, but takes those assigned by the district through the magnet school lottery enrollment system. WEP works with counselors at participating high schools to identify about 15 students to participate each semester. Students must have at least a C average and their school schedule must allow them to work during 5th and 6th periods. Students fill out an application and are individually interviewed by the program coordinator.[8] Seniors are given precedence over juniors.

**Work Experience.** As mentioned earlier, MMHS students spend one morning a week at their internship. Tenth- and eleventh-graders rotate through four sites during the year, spending three to five hours per week at the intern site. Seniors typically spend five hours a week at one or two sites. Tenth-grade students also attend class two hours a week, which typically features guest speakers. All students keep journals, which the supervising teachers collect and grade. WEP students can work up to 16 hours per week and spend one afternoon attending class at the program site.

As for work experience, the MMHS students all intern in some health-related area (e.g., clinics, hospital departments, medical research laboratories, veterinarians), while WEP student work is more varied. WEP's employers include public and private, large and small companies; some are local or regional establishments (e.g., a cable company, law offices); others are part of large national or international companies (e.g., video store chain).

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[7] This emphasis on college preparation is reflected in several aspects of the program. They discuss the work experience portion as an internship, not work. The worksites are called resource sites, not employers. In fact, when we initially approached the school to participate in the study, the administrators declined at first because they said they were not a vocational program and were not providing work-based learning.

[8] The coordinator has standardized her selection process, giving students points for attendance, attire, and so on, and has established a minimum criteria for selection into the program. Occasionally, the coordinator will admit students who do not meet all the requirements, but is highly recommended by the school counselor. Although she says these exceptions never work out, she continues to make them because "maybe the next student will work out."

We asked students to report the title of their job or position and their main duties (See Tables 3 and 4). Not surprisingly, the MMHS students described themselves as volunteers[9] or as medical assistants. WEP students' responses were much more varied, and over half said they had clerical positions. As for main duties, most WEP students described their main duties as clerical (40 percent) or data entry (17 percent, See Table 4). By contrast, only 4 percent of MMHS students described their work as clerical or computer related—they were engaged in laboratory work (23 percent), going on hospital rounds (14 percent) or working with patients (21 percent). About one-fourth of the MMHS students , compared to 10 percent of WEP students, said their duties were varied. This probably reflects the difference between the two programs: where students are paid, it is likely that they will have specific work assignments and be able to describe them as such; where students intern for career exploration, they may be purposely given a variety of duties.

**Table 3**
**Students' Description of Jobs or Positions**

| | MMHS (N = 53) | WEP (N = 38) |
|---|---|---|
| Volunteer | 40 | – |
| Clerk/secretary | 4 | 53 |
| Child care worker | 2 | 5 |
| Research/lab/pharmacy assistant | 28 | – |
| Hospital department assistant | 25 | – |
| Nurse assistant | 13 | – |
| Paralegal | – | 3 |
| Administrative assistant | – | 11 |
| Customer service representative | – | 8 |
| Sales | – | 3 |
| Human resources | – | 11 |
| Collection representative | – | 3 |
| Cashier/teller | – | 5 |

NOTE: Percents do not sum to 100 due to rounding.

According to the survey, students in both programs seem equally satisfied with their work experiences as a whole (mean ratings 4.18 for MMHS students and 4.31 for WEP, on a five-point scale, 5 = extremely satisfied). Only two students, both enrolled in WEP, said they were "extremely dissatisfied" with the experience. In the next section we look at the quality of work experience in more detail.

**Coordination.** Both programs have a written agreement between the school and worksite. At MMHS, each resource site provides a statement of learning objectives that all students are expected to achieve during the rotation. In addition to keeping their daily journals, at the end of each rotation students must answer questions corresponding to the learning objectives, interview two people at the site, and learn about the college path to their job. Supervising teachers collect journals and monitor student attendance at the internship site.

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[9] The school's view of WBL as a volunteer internship was well ingrained in these students. Some had a difficult time with survey questions that referred to their WBL experience as their "job," because they associated jobs with work for pay.

## Table 4
## Students' Description of Main Duties at Worksite

| | MMHS (N = 52) | WEP (N = 40) |
|---|---|---|
| General clerical/office work | 2 | 40 |
| Computers/data entry or processing | 2 | 17 |
| Accounting/invoice/payroll | – | 3 |
| Assist professional (e.g., doctor, lawyer, engineer) | 10 | 5 |
| Child/baby care | 2 | 5 |
| Pharmacy tasks | 2 | – |
| Assist patients/translate for patients/ take vital signs | 21 | – |
| Observe procedures/go on rounds | 14 | – |
| Laboratory work/conduct lab tests | 23 | – |
| Varies/unspecified | 25 | 10 |
| Cashier | – | 3 |
| Stock/parts | – | 5 |
| Sales/retail/displays | – | 8 |
| Disconnect and restart cables | – | 3 |
| Customer service | – | 3 |

NOTE: Percents do not sum to 100 due to rounding.

WEP has a contract with each employer, which stipulates that the employer will provide an "educational, work-based learning site" for a certain number of students, a safe working environment and 50 percent of the student's salary, and will attend a three-and-one-half-hour mentor training class. WEP teachers visit students and supervisors on site, collect supervisor evaluations which form part of the grade for the program, and send grades and attendance information to the student's home school. The classroom portion of WEP includes image and comportment, computer skills, conversational Spanish, and other topics (e.g., conflict resolution). Students spend two weeks in class before going out on the job. The coordinator recruits employers in the community who will give students productive work experience, ideally where students have some probability of being hired after the semester is over. In both programs, students receive elective course credit for their work experience, and employers know the program coordinator is there to deal with any problems or issues that arise.

### (2) Quality of Work Experiences

We begin by considering Kohn and Schooler's "substantive complexity" which Stern et al. (1990) separated into three parts: (a) cognitive complexity; (b) physical challenge; and (c) opportunity to develop work-related social competence. Cognitive complexity is comprised of the following concepts: use of reading, math, and writing on the job; use of skills and knowledge learned in school, not limited to literacy and numeracy; mental challenge on the job; perceived opportunity to learn useful skills and knowledge on the job; and use of existing skills and abilities not necessarily learned in school. Physical challenge is assessed by the amount of time students spend working with their hands and the students' perception of the degree of physical challenge present. Opportunity to develop work-related social competence may be proxied by the reported amount of contact with people on the job. While our survey does not permit the replication of all aspects of Stern's analysis of "substantive complexity," it does provide student perceptions of their work experiences on broadly similar items. We discuss each in turn.

*(a) Cognitive Complexity*

To assess aspects of cognitive complexity, we asked students the extent to which the work experience helped them learn how to learn, improve in basic skills (math, reading and writing), and to make decisions. A second item asked the extent to which the job or internship improved the student's ability to think and solve problems, taught them things useful for later life, and made use of the skills learned in school. (Scale of responses for these two items: 1 = "not at all," 5 = "a great deal"). Finally, we asked students how often they have to think of new ways of doing things or solving problems on the job (1 = "none of the time," 5 = "almost always").

As Table 5 shows, the students' perceptions of various measures of cognitive complexity are, on average, remarkably similar, and marginally positive overall. Most students felt work helped improve basic skills (50 percent of MMHS and 58 percent of WEP students responded 4 or 5) and made use of skills learned in school (68 percent of MMHS and 64 percent of WEP students responded 4 or 5, respectively). Similarly, 69 percent of students in each believed their work experience taught them general things that will be useful in later life.

Students in both programs also felt their work experience gave them the opportunity to learn new skills beyond the basics—in particular, to "learn how to learn," make decisions, and think and solve problems. The majority of students in both programs rated these items 4 or 5. On the other hand, students also report that their work is not very intellectually stimulating: only 17 percent of MMHS and 13 percent of WEP students describe their work as "mentally challenging," and nearly 30 percent of students in both programs say the work is not challenging at all.

## Table 5
## Students' Perception of Quality of Work

| | MMHS (N = 55) | WEP (N = 43) |
|---|---|---|
| COGNITIVE COMPLEXITY | | |
| Learn how to learn | 4.09 (1.31) | 4.07 (1.16) |
| Improve in basic skills | 3.27 (1.59) | 3.55 (1.33) |
| Make decisions | 4.07 (1.20) | 3.93 (1.33) |
| Improve ability to think and solve problems | 3.51 (1.40) | 3.51 (1.29) |
| Teach things useful in later life | 3.96 (1.10) | 3.91 (1.31) |
| Make use of skills learned in school | 3.98 (1.11) | 3.86 (1.17) |
| Think of new ways of doing things | 2.89 (1.06) | 3.09 (1.23) |
| PHYSICAL COMPLEXITY | | |
| Time working with hands, tools, or machines | 3.56 (1.27) | 4.11 (1.12) |
| SOCIAL COMPETENCE | | |
| Work involves dealing with people | 3.76 (1.41) | 3.50 (1.36) |
| Learn to get along with people | 4.24 (1.02) | 4.42 (0.85) |
| Get to know people with different backgrounds | 3.81 (1.24) | 4.02 (1.16) |
| Work with adults | 4.54 (0.66) | 4.64 (0.85) |
| Work with others of own age | 2.65 (1.34) | 3.28 (1.56) |

NOTE: All items 5-point scales. Means presented first with standard deviations in parentheses.

Finally, we asked students to report whether their job required any reading, writing, and math and, if so, the types of activities called for on the job. Here we find some differences between the two programs. First of all, it's important to note that many students reported that their job does not require any reading, writing, or math. Thirteen percent of MMHS and 18 percent of WEP students don't read; 51 and 34 percent, respectively, don't use math; and 18 and 23 percent don't write on the job. The level of writing employed on the job was significantly higher for MMHS students, who were more likely to say they wrote reports or manuals or prepared written materials using a given format ($t = 2.57$, $p < .01$). WEP students more often reported writing simple sentences or filling out forms.[10]

The two programs do not differ significantly with respect to the level of math and reading employed on the job. Not surprisingly, the most frequently-reported reading activity in both programs is "read safety rules, instructions in the use and maintenance of equipment and tools." Compared to MMHS students, WEP students are twice as likely to report reading job manuals, technical journals, financial reports, and legal documents. This difference probably reflects the fact that WEP students are engaged in paid, productive work, where procedures and tasks are codified in manuals or technical documents. Of students using math on the job, MMHS students reported higher levels of math use than WEP students, including calculating surface area, volume, or weights or applying fractions, percentages, etc., to solve work problems.

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[10] Students checked all the ways they employed reading, writing, or math. Mean scores for each were constructed by assigning a value to items in order of complexity and assigning each student the highest value he or she reported. For example, 1 = print or write simple sentences and 5 = write manuals or editorials. A student checking both items would receive a writing score of "5".

### (b) Physical Challenge

The second dimension of substantive complexity measures to what extent the job or internship challenges the students in a physical sense. Students were asked to indicate how much of their time involves working with their hands, using tools or machines (scale from 1 = "none of the time" to 5 = "all of the time"). WEP students reported significantly more time engaged in such physical activity ($t = 2.28, p < .03$). On the other hand, only 7 percent of the MMHS students and 2 percent of WEP students describe the challenges on the job as "mainly physical."

### (c) Opportunity to Develop Work-Related Social Competence and Autonomy

Mainquist and Eichorn (1989) describe social competence as an important dimension of a person's capacity to perform successfully at work. Hence, as Stern et al. (1990) have noted, the opportunity to develop social competence through WBL experience may be important for students' future success. Our survey contained a number of items pertaining to social competence (see Table 5). While relatively few students in either program described the challenges in their work as "mainly social" (7 percent for MMHS, 10 percent for WEP), they spent a moderate amount of time on the job "dealing with people (for example, selling to customers, talking to your boss, taking care of children, etc.)," with the MMHS students marginally more so. About 80 percent of the students in both programs believed that their work experience had helped them learn to get along with people (responded 4 or 5, with 5 = "a great deal").

This picture of similarity between student perceptions of the programs is further confirmed when contrasting the opportunities WBL provides for interaction with people of very different backgrounds, adults, or people of similar age. Students from both programs interact with people with diverse backgrounds to a certain extent and interact with adults while on the job. Eighty percent of WEP students, compared to 64 percent of MMHS students interacted with adults "a great deal." WEP students were significantly more likely to report working with people their own age ($t = 2.10, p < .03$).

The extent to which students are able to work independently, or have "job autonomy," may play a role in the development of work-related values and self-concept (Mortimer and Lorence, 1979a, 1979b). Stern et al. (1990) developed an index of job autonomy from survey questions (the sum of non-missing items) focusing on the degree of autonomous decision making, the control the student exercises on the job, the closeness of supervision, and whether the students believed their job helped them develop the ability to take responsibility, set priorities, and make decisions. Our survey replicated these items. However, of six separate items, *none* of them are statistically different between MMHS and WEP, nor are the mean index scores (20.44 and 19.75, respectively).

Overall, it is interesting that both groups of students feel that they have some autonomy in controlling their time—about half of the students in both groups responded 4 or 5 (5 = "almost total control"). MMHS students felt they had more autonomy in decision making and were less closely supervised than WEP students (46 percent and 57 percent, respectively, indicated "my supervisor tells me what to do" or "my supervisor usually discusses it with me"). By contrast, more WEP students reported that "I am my own boss" (18 percent, compared to 10 percent MMHS students). Students in both programs felt their work experience helped them learn to take responsibility, set priorities, and make decisions—average score on each item for both groups was 3.9 or higher. Generally, reported job autonomy was high for all, with some small variations in the amount of supervision.

### (3) Relationship Between School and Work

We now discuss our survey results with regard to the relationship between WBL and school. Several survey questions related to the integration of school and work; these revealed some statistically significant differences between the programs that can be explained by differences in program design (See Table 6). First, the teachers in the WEP program are more likely to "talk about [the] work experience in the classroom" than the teachers at the MMHS (scale 1 = "not at all true," 5 = "very true;" $t = 2.53$, $p < .01$). Students in the WEP program work four days and attend class at the WEP site one day per week. The WEP teachers use this class time to reinforce the work experience and to discuss any work-related issues that might arise. At MMHS, some teachers are assigned to monitor the students' internships, by making sure the students attend and by collecting and grading the journals that students keep about their work experience. According to the program coordinator, however, it is up to the teachers to integrate academics and health- or medical-related content in their individual classes, and not all teachers choose to do so.

**Table 6**
**Relationships Between School and Work**

| | MMHS (N = 55) | WEP (N = 43) |
|---|---|---|
| CURRICULUM LINKS | | |
| Teacher talks about work in class | 2.73 (1.34) | 3.45 (1.45) |
| Work relates well to school program | 4.07 (1.16) | 3.34 (1.32) |
| Can apply what is learned in school on job | 3.38 (1.31) | 3.60 (1.33) |
| School learning helps on job | 3.65 (1.00) | 3.53 (1.20) |
| Work helps understand school learning | 3.29 (1.24) | 2.84 (1.33) |
| Work helps recognize subjects liked/disliked | 3.58 (1.34) | 3.02 (1.45) |
| STRUCTURAL LINKS | | |
| Teacher/coordinator visits site regularly | 3.27 (1.31) | 2.12 (1.15) |
| Teacher/coordinator evaluates me | 4.19 (1.19) | 3.10 (1.31) |
| Teacher/supervisor developed training plan | 2.91 (1.35) | 2.63 (1.43) |

NOTE: All items 5-point scale. Means presented first with standard deviations in parentheses.

MMHS students are more likely to say that the "work experience relates well to [the] school program," and that the program "helps me understand things I am studying in school" ($t = 2.85$, $p < .01$ and $t = 1.73$, $p < .08$, respectively). Similarly, MMHS students feel more strongly that the program "has made me recognize the subjects I really like and don't like" ($t = 1.95$, $p < .05$). Collectively, these responses suggest that the MMHS experience adds value to the school experience. It provides opportunities for students to see how their school learning is applied on the job and to gain some appreciation for different subject areas.

Another aspect of school-to-work coordination is the way the programs supervise students and assess work performance. According to the survey responses, the students' perceptions are that the MMHS teachers and coordinators are more involved than WEP teachers. Every three weeks, the WEP instructors visit the worksite, meet with the mentor/supervisor and student, and complete an evaluation form. Worksite mentors also sign a weekly job log that verifies students' work time and activities and complete a monthly student evaluation form. These logs and evaluations go to the WEP instructor. MMHS teachers, on the other hand, primarily monitor attendance once a week and collect students' journals. While it appears that WEP has more formal, structured supervision practices, MMHS' are more frequent. MMHS students are significantly more likely to report that "teachers/coordinators visit the site regularly" and "often evaluate me" than WEP students (see Table 6). Many students seem unaware that their program has a written training plan that guides some aspects of their WBL experience (43 percent of MMHS and 48 percent of WEP students rated this item 1 or 2, where 1 = "not at all true," and 5 = "very true"). This seems especially surprising for MMHS students, who supposedly answer questions and fulfill other requirements included in a site's list of learning objectives.

The broad range of responses on the structure questions suggests that students don't uniformly understand the way the program is organized between the school and work components. While this does not necessarily always matter, it may affect students' motivation or send the wrong signals. If students are being evaluated, the best policy is to let them know the criteria and give them regular feedback on their performance (Frederiksen, and Collins, 1996). When asked how you know how well you are doing on the job, only 16 percent of WEP students, however, report that they receive a "written evaluation from work;" 14 percent say they "don't get much feedback." MMHS students identify more types and more frequent feedback: 15 percent hear from their teacher, 51 percent from written evaluation at work, and 27 percent from written evaluation at school.

Overall, the MMHS students seem more aware of the structural aspects of their program that are designed to coordinate school and work activities and to evaluate and monitor their WBL performance, and they report more involvement of the adults than WEP students. But students in both programs seem vague on many structural features.

### *Job Conflicts with School*

From survey responses, we determined that WEP students work an average of 17.8 hours per week, compared to 4.7 work hours for MMHS students ($t = 14.17$, $p < .0001$). This raises the important question of whether WBL is perceived to conflict with students' schooling. Following Stern et. al. (1990), we constructed a "conflict" index by averaging scores on several Likert-type items (affect on grades, homework, courses taken, preparation for class, feeling tired in class, and desire to stay in school). WEP students reported significantly more conflict than MMHS students—using a simple average of items, WEP students rated the degree of conflict as 2.13 (.67) compared to 1.68 (.59) for MMHS, suggesting that their work negatively impacted some aspects of school performance. The correlation between hours worked and degree of conflict (for the pooled sample, i.e., across programs) was small, but marginally significant ($t = .231$, $p < .03$). Various constructions of the index yielded substantively similar results.[11]

Looking at the separate underlying items, two of the six items measuring job conflict show statistically significant differences between the programs. The most pronounced difference occurs when the students are asked how much they agree or disagree with the statement that their WBL "makes me want to quit school as soon as possible." WEP students are rather more likely to want to quit school than are the MMHS students (mean ratings 1.76 and 1.25, respectively, $t = 2.46$, $p < .01$). Similarly, and again not surprising given the large difference in hours worked, WEP participants are more likely to agree that "I have less time to do my homework" than MMHS students (mean ratings 2.54 and 1.73, respectively, $t = 3.1$, $p < .01$).

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[11] For example, we used an index on non missing items calculated as a simple average (regardless of each item's scale), and a weighted average so that each item in the index was counted equally. The results are the same regardless of the index used.

Clearly, these two results suggest potentially long-run negative ramifications for the students' academic development (which in turn could affect future earnings) of participation in an intensive WBL program. This picture is corroborated when the students were asked whether the "work experience [has] influenced the courses [they've] taken or other school activities." Forty-two percent of WEP students said they had either "taken fewer courses to have more time for work," "taken fewer or easier courses to keep grades up when working," or "reduced extracurricular activities (clubs, sports, band)." However, 93 percent of MMHS say that their internship had not influenced their courses or activities. Conflicts with some aspects of school, however, do not necessarily affect students' grades: 95 percent of students in both programs report that either their grades have not changed or that their grades have improved as a result of the work experience.

### *Effect on Social Relationships*

The survey also permits an analysis of the influence the programs have on the students' friendships. Not surprisingly, in light of the differences in work in the two programs, we find significant differences in students' responses to all three relevant items. WEP students were more likely to agree with the statement "I see my friends less often than I used to" (mean ratings 2.69 (1.42) and 1.51 (1.07) for WEP and MMHS, respectively, $t = 4.50$, $p < .001$).

Does the fact that WEP students earn money for their work perhaps compensate for the increased pressure on friendships? Students were asked if they agreed that "I have more money and am able to out with my friends more often." MMHS students more strongly disagreed with this statement (mean ratings 1.69 (1.12) and 3.60 (1.24) for MMHS and WEP, respectively, $t = 7.92$, $p < .001$), though this may simply be due to the fact that they disagree with the first part of the statement (since their work is unpaid). WEP students are also more likely to perceive that their WBL "gives me higher status among my friends" (mean ratings 3.14 (1.47) for WEP and 2.42 (1.50) for MMHS, $t = 2.38$, $p < .01$). For WEP students, there appears to be some compensation for not seeing one's friends as much—work provides status and money to spend when they do see them.

## Conclusions

Although work-based learning appears to be growing in popularity, few studies have examined student experiences in these programs. Earlier research on WBL compared school-supervised work experience, such as that provided in our programs, and non-supervised work experience that characterizes regular youth jobs. The present study corroborates some of these earlier findings, using a similar survey instrument. The most important difference between the programs is the amount of time spent at the worksite per week—we find a statistically significant correlation between number of hours worked and indices of "conflict" with school.

On the other hand, looking at a variety of indices of quality, we find few other differences between the programs. Few students in either program use any higher-level math, reading, or writing skills, but about half the students in each group felt the job helped them learn to think and solve problems. Overall, they do not find their work experience very challenging. While WBL does not appear to significantly enhance basic skills or problem solving, both programs seem to support learning other work-related skills or dispositions, such as social skills or positive attitudes toward work. At least 80 percent of students in both programs report that work experience helped "a great deal" in learning to follow directions, get along with people, take responsibility, communicate with others, strive to do well, and learn how to learn. These findings again corroborate other research in suggesting that high school students gain primarily work-related attitudes and appropriate behaviors from their WBL experiences, rather than technical knowledge and skill (Hamilton and Hamilton, 1989).

Proponents of WBL will likely see positive signs in these results. Students report learning a variety of skills and work-related attitudes and also feel that their work experience was valuable. But the fact that too much work may conflict with schooling is an important consideration that needs to be further examined. Stern et al. (1997) report similar findings when comparing co-op programs and magnet schools. They find a negative correlation between working longer hours in WBL programs and students' grade point average; this relationship is stronger for students in non-school supervised jobs than those students participating in co-op programs. In addition, they find students are more oriented toward employment than toward academic pursuits: participating students may curtail their education in favor of full-time employment, which could ultimately have a negative effect on their level of earnings. However, structural features of the WBL program are also believed to have an important effect on the extent to which there is conflict with work, implying, for example, that coordination between teachers and supervisors to "minimize the conflict between work and school would contribute to developing [the students'] motivation to do good work." In other words, conflict can be mitigated, provided that the work and school aspects of the program are coordinated.

In this study, the program designs appear to support coordination in some ways, but not others. The general school experience for the WEP students is entirely separate from their work experience. Since students are drawn from different schools, and since the WEP classes are held apart from the home school, the regular, home school teachers are not part of the program at all. They may or may not know that a student is even enrolled in WEP and working after school. This makes integration between regular school and work very unlikely. These students see little connection between work and the home school, and the kinds of supports needed to mitigate potential conflicts with school do not exist. On the other hand, WEP does provide classroom time that is very connected to work, where WEP instructors can reinforce school and work connections and where students learn skills useful on the job. WEP also provides important opportunities for participating students that they might otherwise not find. It provides minority students with paid work in the community. It teaches important employability skills—indeed, one of the goals of the program was to fill the gap that exists because high schools pay little attention to fostering employability skills. Some students get full- or part-time employment at the same company after their semester in the program.[12]

At MMHS, the medical careers theme supports integration at a general level, but does not necessarily extend to the classroom. Here, the wider goal of career exploration is met, as students rotate through different medical settings over the course of their school career. Students appear to find opportunities to apply school learning on the job and understand how school learning connects to future work in various medical settings. Unlike the WEP students, they seem aware that teachers and coordinators are present to monitor WBL and report a variety of important feedback mechanisms that can support learning. But students also seem unaware of some program features that presumably coordinate school and work activities, such as a training plan or set of learning objectives.

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[12] The WEP tracking report, which tracked students from Fall 1993 to Spring 1996, shows that 445 students graduated from the program. Of these 57 percent are working and in college; 29 percent attend college only; 8 percent are in the workforce only; 1 percent are unemployed; and 5 percent could not be located.

In one sense, the programs may be seen as successful because they meet their main goals of either promoting career exploration or, as a WEP teacher said, "getting kids job-ready." When compared to the broader goals of WBL and judging the quality of the workplace experiences as *learning* opportunities, the survey data seem to raise more questions than answers. Students seem satisfied with their programs and say they learn many valuable things, but for some, work has its costs. The survey data also suggest that students do not feel very challenged on their jobs and that their work does not require very high levels of math, reading, or writing. In both programs, students are left to make the crucial connections between school and work that justify WBL in the first place: it appears that many are not able to make this connection on their own.

Unfortunately, survey data—though valuable for indicating students' views of their learning at a general level—do not provide answers to some important questions about the quality and value of WBL programs. The real power of the WBL concept is pedagogical—work should give students opportunities to apply knowledge in contexts in which it can be put to use, thereby gaining deeper understanding. Whether WBL can provide such experiences, and at what cost, requires knowing much more about the learning process and the characteristics of work-based learning environments.

Concerns about program quality are especially important because WBL has costs. Our study suggests that time spent at work can negatively impact performance at school for some students. This crucial relationship needs further examination, since our study could not control for other mitigating factors. It may be, for example, that the students who enrolled in WEP were already academically unsuccessful or bored with school and inclined to quit school as soon as possible to join the labor force. In this light, the WEP experience merely reinforced their inclination.

Less often discussed in the literature are the transaction costs associated with setting up, delivering, and monitoring WBL programs. The WEP program requires a substantial yearly investment to subsidize students' wages. The MMHS has a full-time coordinator to organize and schedule student internships. Both programs have plans to expand, and both express concerns about finding the funds and participating employers needed. Are the kinds of outcomes identified in this study worth these costs or not? Are they worth the costs for some students? In order to fully consider the costs and benefits of WBL, a great deal of more work needs to be done.

At the moment, the value of WBL rests on the logical argument that work-based learning will provide students with opportunities to learn beyond what can be offered in classrooms, and that what they learn there is important for their educational and employment futures. Since WBL is associated with a number of costs, it is important to go beyond the rhetoric and to assess the value-added of WBL. Future research, then, must further examine the variety of learning environments offered as WBL and the kinds of learning they promote. In doing so, further work should gather systematic information from the students' perspective. Too many studies emphasize programmatic features, such as connections with employers and the details of implementation. While this work is important for understanding how to design and deliver programs, it does not get at the core purposes of WBL. What we should be most interested in is what students learn and how to design programs that support the learning we hope will take place. In the end, learning is a personal, developmental transformation, so we must pay attention to whether or not that transformation occurs.

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# DISTANCE EDUCATION EFFECTIVENESS AS PERCEIVED BY SECONDARY STUDENTS

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## Abstract

*Electronic technologies that facilitate distance learning with interactive video network (IVN) or interactive television network (ITV) offer promise in these two areas. This study identifies perceptions of students in IVN/ITV courses with respect to the educational quality of the courses offered and their satisfaction with the educational experiences in the distance learning programs. Students were satisfied with the quality of IVN/ITV, believed these courses lived up to their expectations, as well as the expectations of their parents, and that the experience will benefit them in the future. Students believe they do as well in IVN/ITV classes as in a traditional classroom. Students believe that IVN/ITV is an effective way to teach courses in small rural schools where geographic location, adequate funding, and student enrollment are limiting factors.*

## Introduction

Equity and access in education are major issues in rural and urban schools. Electronic technologies that facilitate distance learning with interactive video network (IVN) or interactive television network (ITV) offer promise in these two areas. Tift (1989) commented that Technology-based education is maintaining the viability of small, rural schools through equitable access to a quality education by all students. Some of the underlying factors as noted by Barker (1990) include teacher availability, low student enrollments, and geographic location.

The literature favors the effectiveness of this technology as an instructional delivery method. "Well-designed distance education programs are equally effective in terms of learner outcomes with resident instruction, in general, and produce superior learning outcomes in specific applications" (Kelly, 1993, p. 76). An analysis of published reports found extensive evidence that courses delivered by a teacher at a distance were equally effective as those with the teacher in the classroom. Distance education is effective when effectiveness is measured by achievement, by attitudes, and by cost-effectiveness. Students achievement in interactive distance education classes has been as good as or better than that of students learning from traditional teaching methods (Jones, Simonson, Kemis, & Sorenson, 1992). One limitation, however, is the effectiveness of distance education for some students who need direct interaction with a classroom instructor and with other students (Schmidt and Faulkner, 1989). Students who select courses taught through the IVN/ITV systems are more likely to be self motivated and higher achievers. These students are the ones who typically have positive educational outcomes (Schrum, 1991). Thus, while there is some controversy, experts in distance education believe it can be as effective an educational mode as traditional methods.

Distance, technology and education have been linked for many purposes in a variety of venues. Distance education has been provided to teachers using a variety of hardware and software; however, as data transmission has evolved and become more affordable, distance education classes have become more and more interactive. Barker, Frisbie, and Patrick (1989) considered the wide range of "distance education" delivery systems. More recently, researchers such as Charron and Obbink (1993) have described the variety of techniques that they believe facilitates distance learning. Swan and Jackman (1995) outlined several teaching models appropriate for delivering instruction at a distance. In addition to describing distance education technology, many authors have outlined procedures which can be used to craft classes utilizing varied distance education technologies (Brinkley, Pavlechko, and Thompson, 1991; Swan, 1996).

A review of the literature indicates that numerous professional education courses and inservices (Rule & Stowitschenk, 1991) have been delivered to veteran teachers using distance education. Many teacher related courses have been directed toward the needs of rural educators (Chow, 1989, Swan, 1993). Although much work has been conducted with rural teachers, little seems to have been done with students in either rural or urban settings.

Quantitative and qualitative evaluation techniques have proven to be important tools by which distance education can be improved and researched. The evaluations that have been reported in the literature are vary. This is in part due to length of the evaluation, age of students, class topics, and specific technologies utilized (Grimes, Krehbiel, Nielson, & Niss, 1989).

Some long-term evaluations have been conducted by those involved in distance education. Jackman and Swan (1994) evaluated graduate level students and their understanding of teaching models used in effective distance education programs. Others have attempted major studies which have addressed the effectiveness of distance education by evaluating previously published studies (McNeil & Nelson, 1991).

Some specific reports regarding education students enrolled in distance education courses have appeared in the literature. In 1989, Beare explored the effectiveness of different distance education delivery systems by utilizing measures of student achievement and course evaluation and comparing these data to measures from more traditional instructional environments. Swan and Brehmer (1994) reported on perceptions of secondary educators and administrators toward instruction delivered via two-way interactive video networks.

Although much of the research seems to center on courses developed for inservice and graduate students in education, some studies have included components emphasizing programs for elementary and secondary education (Shapiro, Heck, & Freedenberg, 1992; Swan, 1995). In the last few years, a number of distance education articles have appeared in the literature that involve some aspects of attitudinal measurement.

The Greater Southeast ITV Consortium has studios in ten rural secondary schools and two vocational centers in the Southeast corner of North Dakota. This consortium is struggling to provide educational equity and access to students within the consortium enrollment area.

Because of their small 9-12 enrollment, (Fairmont has 53 students, Hankinson has 126, Lidgerwood has 87, Milnor has 68, North Sargent at Gwiner has 70, Oakes has 199, Richland at Colfax has 85, Sargent Central at Forman has 138, Verona has 20, and Wyndmere has 93 students), these schools find it difficult to offer selected limited enrollment, advanced placement and enrichment courses. Financial constraints make it impractical to offer courses at each location. The Great Western ITV Consortium has studios in 5 rural secondary schools in the west central region of North Dakota. Like the Southeast Consortium the Great Western Consortium is struggling to provide students equal access to certain courses. Limited student enrollment (student enrollment 9-12, Beulah 302, Center 148, Golden Valley 52, Hazen 278, and Stanton 50 ), financial constraints and limited access to qualified teachers by these school districts has forced them to develop alternatives in providing courses.

The IVN/ITV system provides a way for the school districts to combine resources and pool students who are interested in classes that normally could not be offered. Examples are Spanish, College Algebra, AP English, and Calculus.

In light of recent research regarding distance education, the project reported in this article appears to be fairly unique in that two-way audio/two-way full-motion video distance technology was used to link simultaneously a host site and several other schools which were provided with specific courses. Full motion means there is no "starting" and "stopping" of the image. It appears that limited detailed surveys have been reported for secondary students attending a two-way audio/two-way video (IVN - Interactive Video Network) distance education courses from one part of a state as compared to students in similar situations in another part of a state. Both school consortiums were using almost identical types of equipment, both hardware and software.

North Dakota's IVN/ITV system uses CLI codecs and Multipoint Control Units. They updated the three MCU Classics to new MP2 in 1995 to be fully standards compliant. This additionally provides standards-based multipoint conferencing. A dial-up video conferencing service, capable of serving any brand codec, was developed around the installation of these MP2s.

The classroom equipment was initially provided by Todd Communications. US WEST provides the intra-LATA communications. US Sprint provides for inter-LATA communications. Terrestrial T-1 lines are used for transmission. In some places, these happen to be fiber optic lines; however, normal T-1 lines are used in most places.

In addition to the CLI Rembrant 11/30 Codec equipment, IVN/ITV classrooms utilize the Elmo Ev-308 Optic view (AC120V, 60Hz, 30W). The television monitors are equipped with a Panasonic remote control unit (WV-7330) and video switcher (WJ 200RB). The IVN Group has continued to upgrade the classroom equipment so these model numbers may not be relevant. The originally installed NEC AEC-400 Acoustic Echo canceller and the TOA 900 series amplifier (A-903-A) were updated by utilizing a combinations system processor which provides high quality audio with BOSE amplifiers. They used a Shure AM Mixer. The controls on the instructor desks are the System 500 - Sigma Electronic & Desktop SVX-210 Video Switcher.

The IVN/ITV system is two-way audio and video interactive network. Students and teachers at all locations can see, hear, and talk to each other over the system. There are two video cameras in each classroom; one camera is on the teacher's work station and the other camera is focused on the students. Each classroom has at least four television monitors in the room for the students and two monitors located on the ceiling over the students' desks for the teacher. One of the student monitors shows the teacher and/or visual aids and the other monitor shows the students at individual sites. Every classroom has the same equipment and every school can be an originating site. Additionally, each site has facsimile machines, telephones, and computer terminals.

## Purpose and Objectives

The problem addressed in this study is the lack of knowledge and understanding about IVN/ITV in public schools and its impact on students' learning and their attitudes toward learning. This study will identify perceptions of students in IVN/ITV courses with respect to the educational quality of the courses offered and their satisfaction with the educational experiences in the distance learning programs. The specific research objective was to: determine student perceptions about IVN/ITV courses. Subquestions were: (1) gender differences in student perceptions, (2) number of students taking classes by period and by grade level, (3) differences in students' perception at the remote sites and the host sites and, (4) reasons why students took IVN/ITV classes.

## Procedures / Analysis of Data

Data were collected using a structured questionnaire developed by the researcher. The research method used was descriptive in nature. While quantitative instruments provided some measurements of satisfaction and fulfillment of expectations, qualitative data collected added in-depth insights.

The survey population was identified as all students enrolled in IVN/ITV courses within the two consortiums in the 1994-95 academic year, spring term 95. The population was homogeneous by age and academic grade levels, 9-12 grades. All of the students were enrolled in IVN/ITV courses, which may not be representative of the typical high school student. Content validity was established by having the pilot questionnaire reviewed and completed by a panel of experts that included experts in evaluation and measurement, technology diffusion, classroom teaching, administration, and curriculum. The pilot study was administered to three groups: 1) faculty and students of sending and receiving sites from a secondary school consortium, eight schools, who were not involved in the study, 2) the advisory committee for distance education technology in the region and 3) university faculty involved with distance education at North Dakota State University. In addition, the validity of the survey was evaluated, in part, by considering three threats to validity outlined by Morris et al. (1987). First, lack of standardization in test administration was not an apparent threat to validity. Data collection took place once at the end of the semester. Furthermore, during the data collection, instruments were distributed and students were asked to simply fill out the instrument using guidelines presented at the beginning of the survey. All students received the same amount of time for survey completion, and no hints or clues regarding "proper answers" were supplied. Second, response bias or evaluation apprehension was lessened by telling students that their views were only to be used to evaluate the class. Third, the format of surveys can also affect the validity of measures; however, analysis of the data suggests that most students used the scale in an internally consistent manner. Also, students did not have any questions regarding survey format when the data were collected. Finally, surveys were completed blind and were not linked to course grades in any way. The data from the pilot test of the questionnaire were analyzed for reliability. Cronbach's alpha and factor analysis using the Statistical Package for Social Sciences (SPSS) were used to establish reliability, r= .82. Modifications were made to enhance validity and reliability.

The questionnaire was developed for quantitative measures of students' perceptions of the experiences, with a series of 27 statements using a four point Likert scale included: strongly agree (a value of 1), agree (2), disagree (3), and strongly disagree (4). Question 28 was designed to determine why the student took the IVN/ITV course and frequency responses were used as the method of analysis. Qualitative measures, using three open-ended questions, asked about students' feelings of the ITV courses in which they were currently enrolled.

The survey questionnaire was administered to all students enrolled in IVN/ITV courses in the 1994-96 academic year. All respondents answered the survey at the same time under similar conditions. Immediately following the completion of the survey, the researcher analyzes data to determined if the respondents understood and felt comfortable answering the questions. The population was homogeneous by age and academic grade levels. All of the students were enrolled in IVN/ITV courses, not representative of the typical high school student.

Data were collected from the students enrolled in all secondary IVN/ITV courses offered by the consortiums of all schools located in the Greater Southeast ITV Consortium and the Great Western Consortium. Students taking more than one IVN/ITV course were asked to fill out only one questionnaire. Three-hundred eleven students enrolled in IVN/ITV classes in the Southeast consortium completed the structured questionnaire; 18 questionnaires were unusable leaving 293 usable instruments and 86 students enrolled in IVN/ITV courses in the Great Western Consortium completed the questionnaire. A total population of usable instrument were 379.

## Results

Data from grade level of students taking IVN/ITV courses showed that as students progressed in grade level, more students were taking IVN/ITV courses. Course enrollment was as follows: grade 9 had 54 students enrolled, grade 10 had 88, grade 11 had 106, and grade 12 had 130. Between the two school consortiums there were 119 male students and 260 female students enrolled. Females completed 68.6% of the surveys and 73.4% of the students were at remote sites. The study revealed 101 students enrolled at the host sites and 278 enrolled in remote sites. We also discovered that 124 students of the 293 students in the Southeast Consortium enrolled in Spanish and 169 in all other IVN/ITV classes. The Great Western Consortium had 34 students enrolled in foreign language: French, German, Latin, and Spanish. Student enrollment by class period indicated consistent numbers in all periods. During class period 1 there were 75 students, period 2 = 60, period 3 = 42, period 4 = 64, period 5 = 54, period 6 = 46, and period 7 = 35 students enrolled. One student was enrolled in a course (statistics) before school started (period 0) and 2 students were enrolled in a course (statistics) after school ended (period 9).

Table 1 identifies perceptions of students toward the IVN/ITV courses in which they were enrolled at both home and remote sites. Students identified that they would take another ITV course and their parents liked the idea of IVN/ITV courses being offered to students.

They disagreed with the statements that materials were late, they would earn higher grades, and that more students cheat in IVN/ITV courses.

**Table 1**
**Combined rank order of student perceptions towards IVN/ITV courses.**

| Statement | Mean | | SD | |
|---|---|---|---|---|
| | SE | WR | SE | WR |
| I would take another ITV class if it were one I wanted. | 1.00 | 1.83 | 0.68 | 0.81 |
| My parents think that ITV classes are a good idea. | 1.00 | 2.07 | 0.73 | 0.66 |
| ITV is a good method to offer some courses. | 1.70 | 1.77 | 0.77 | 0.69 |
| I could see the TV monitors from where I sat. | 1.96 | 1.94 | 0.91 | 0.71 |
| I was able to see all the materials the teacher presented. | 2.00 | 1.99 | 0.66 | 0.62 |
| I was able to talk to the teacher as often as I needed to. | 2.04 | 2.05 | 0.78 | 0.72 |
| The chairs and/or tables in the ITV room were comfortable. | 2.12 | 2.14 | 0.98 | 0.69 |
| I like my ITV class better than my other classes. | 2.40 | 2.27 | 0.78 | 0.79 |
| I got to know the students from the others schools. | 2.29 | 2.43 | 0.77 | 0.82 |
| I could hear the other students in the other sites. | 2.34 | 2.41 | 1.08 | 0.77 |
| I would be interested in taking college courses offered on ITV. | 2.50 | 2.33 | 1.21 | 0.83 |
| Student discipline is better in the ITV classes. | 2.40 | 2.49 | 0.89 | 0.70 |
| My work was graded and returned as fast as in my other classes. | 2.50 | 2.54 | 1.02 | 0.82 |
| The materials for the class were often late in arriving. | 2.80 | 2.24 | 0.86 | 0.72 |
| I earn higher grades in my ITV class than my other classes. | 2.80 | 2.58 | 0.99 | 0.77 |
| Most of the talking/questions were done by students in host site. | 2.60 | 2.91 | 0.83 | 0.76 |
| More students cheat in ITV classes than other classes. | 2.80 | 2.99 | 1.13 | 0.63 |

SE = Southeast Consortium WR = Great Western Consortium

Table 2 identifies perceptions of remote site students toward the IVN/ITV courses in which they were enrolled. Students agreed with the statements that they could hear the teacher well, that the teachers paid attention to all students, that they could ask questions at any time, and that the teachers knew the students as well as those in the home site.

When students were asked to identify why they took an IVN/ITV course they responded by identifying various reasons. "I thought it would be interesting to take an IVN/ITV class" identified by 215 students, "I really wanted the class and it was the only way to get it" by 202 students, "Because it was the best option for that particular hour" by 193 students, "Because my friends were taking the class" by 64 students, and "My counselor/teacher/principal put me in it" by 23 students.

**Table 2**
**Rank order of perceptions of All Remote Site students towards IVN/ITV courses.**

| Statement | Mean | | SD | |
|---|---|---|---|---|
| | SE | WR | SE | WR |
| I could hear the teacher well. | 1.95 | 2.01 | 0.67 | 0.62 |
| The teacher paid attention to both home and remote sites. | 2.00 | 1.98 | 0.97 | 0.61 |
| I felt I could ask questions in class when it was necessary. | 2.00 | 2.11 | 1.03 | 0.65 |
| It was easy to ask questions in class. | 2.10 | 2.07 | 1.02 | 0.70 |
| I would like to meet more with students from other schools. | 2.19 | 2.07 | 0.97 | 0.68 |
| The teacher taught from our site as much as necessary. | 2.00 | 2.39 | 0.79 | 0.77 |
| I felt my ITV teacher knows me as well as my other teachers. | 2.00 | 2.50 | 1.14 | 0.79 |
| I felt the teacher could hear me when I asked questions. | 2.30 | 2.19 | 0.88 | 0.68 |
| I was able to hear questions from other sites. | 2.40 | 2.41 | 0.86 | 0.73 |
| It is easier to cheat at a remote site. | 2.70 | 2.84 | 1.23 | 0.68 |

SE = Southeast Consortium WR = Great Western Consortium

Student were asked to respond to three qualitative questions related to their IVN/ITV course experiences. Question one was "What do you feel are the good things about interactive video network and the classes you are taking on it?" Student responses were summarized as follows: I can take the class I want, It offers classes we normally wouldn't have; Meet new people from different towns; You get a chance to learn another language; Have better teachers for the subject; Learn with different people, teachers and subjects; Have more variety of classes; The teacher involves everyone; and The only way to meet college entrance requirements.

Question two was "What do you feel are the weak points about interactive video network and the classes you are taking on it?" Responses summarized were: It is boring to stare at a TV all hour; Getting papers grades/sent away; Younger students; Some remote sites are not getting the same attention; The equipment doesn't always work; Time schedules are different in different schools; Hard to work with groups; You can't have hands-on learning; Hard to hear at times; Remote sites goof around too much; Quickness of grading and returning tests; Cannot eat or drink anything in the room; Your teacher is not always here; Crowded classrooms; Discipline; Can't see everyone at once; and Teacher not available throughout the day for questions.

The final questions was "How would you suggest changing the interactive video network classes and any other suggestions you might have relating to Interactive Video Network classes?" The responses summarized were: Have teacher visit all sites more often; New seating; Put in more microphones; Have more courses offered over IVN/ITV; Teachers come to different sites more often; I'd like to see more science courses; Put TV's up higher; Better sound; Require everyone to take at least one course over IVN/ITV; and Expand to before and after school hours.

## Conclusions

Gender differences were not found among the students in these two IVN/ITV consortiums. There were no noticeable differences in the opinions of the students at the remote sites and the host sites. Individual schools did not differ on the degree of student satisfaction with the IVN/ITV courses.

Students were taking courses during every class period of the day without major differences in enrollment numbers. Students at both host and remote sites were satisfied with the quality of IVN/ITV courses, believed these courses lived up to their expectations, as well as the expectations of their parents, and that the experience will benefit them in the future. Students believe they do as well in IVN/ITV classes as in a traditional classroom.

Students use IVN/ITV as a regular part of their education and do not want to be singled out as special. Like exceptional students in other classes, they prefer to keep a low profile rather than call attention to attributes that distinguish them from their peers.

Students believe that IVN/ITV is an effective way to teach courses in small rural schools where geographic location, adequate funding, and student enrollment are limiting factors. There is face-to-face, fully interactive teaching and learning taking place in a warm and caring environment that is as effective as traditional methods.

Students are excited about the IVN/ITV courses and agree that offerings should be expanded to include a greater variety of subjects. Students believe that offering courses before and after school hours would be beneficial and would increase the number of students taking courses over the IVN/ITV system.

Students agreed that making the classroom setting more comfortable would facilitate more students enrolling in IVN/ITV courses. They would like to see more microphones in each IVN/ITV classroom as well as locating the TV's higher so every student could see easier. Students were also very concerned with the lack of discipline in remote site classrooms.

Most students liked being part of this new technology. Students use IVN/ITV courses as a regular part of their education and do not think they are special. Students believe that IVN/ITV courses are an effective way to learn in small rural schools where geographic location, adequate funding, and student enrollment are limiting factors. There is face-to-face, fully interactive teaching and learning taking place in a warm and caring environment that is as effective as traditional methods.

## Recommendations

Further research is needed to determine why more applied academic courses are not being offered over IVN/ITV systems. The results of this study did indicate that several instructional areas were not being delivered via IVN/ITV.

Further research is needed to explain the effectiveness of IVN/ITV as an instructional delivery system. The results of this study cannot be generalized to other regions and states without similar delivery systems. The results of this study, however, indicate that the IVN/ITV is potentially an effective medium for instruction.

Further research is needed to determine training needs of instructors and administrators in delivery methods and instructional design. This study indicated that students were bored with only one or two models of instruction being used in IVN/ITV courses.

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